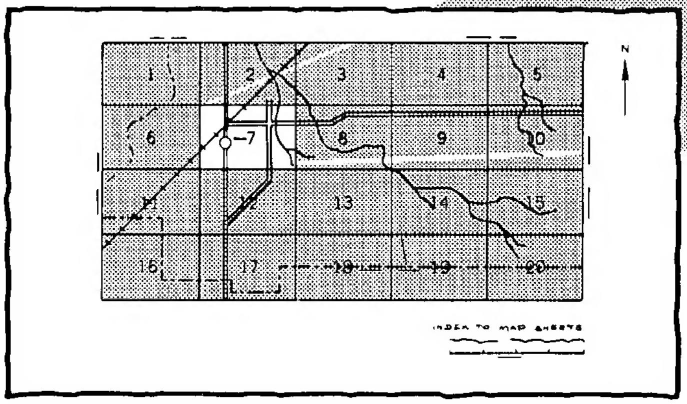
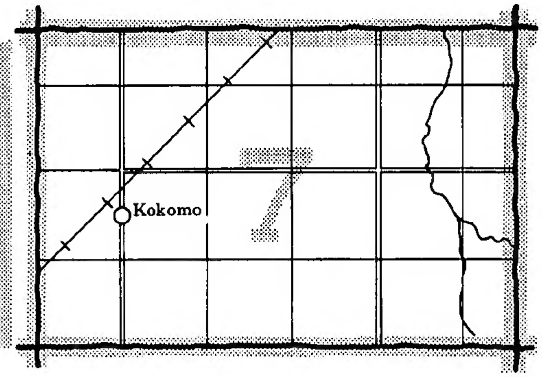
Soil survey of
MONROE COUNTY INDIANA

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Purdue University Agricultural Experiment Station and
Indiana Department of Natural Resources
Soil and Water Conservation Committee

HOW TO USE

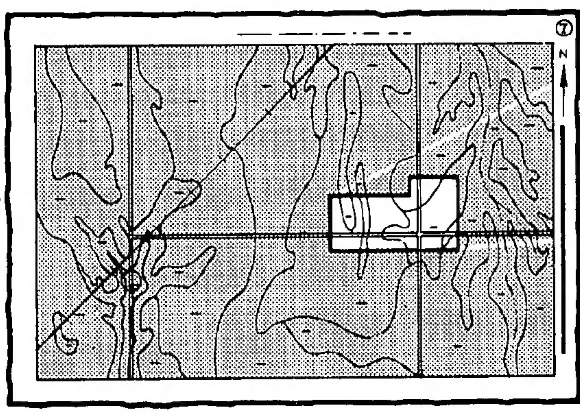
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

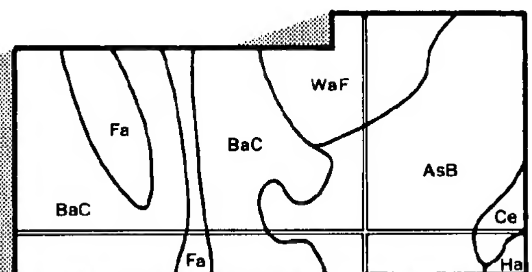




2. Note the number of the map sheet and turn to that sheet.

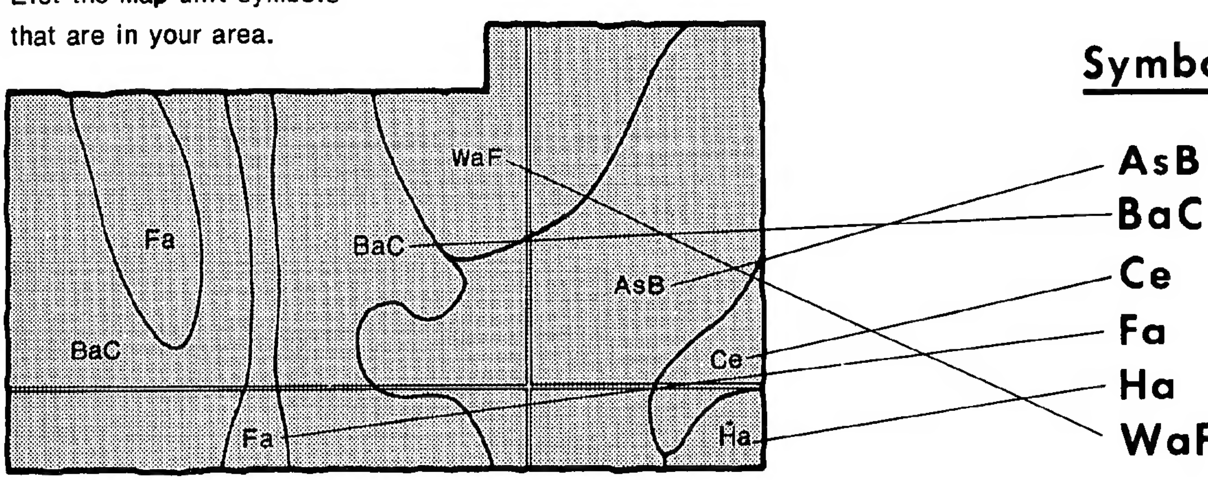
3. Locate your area of interest on the map sheet.





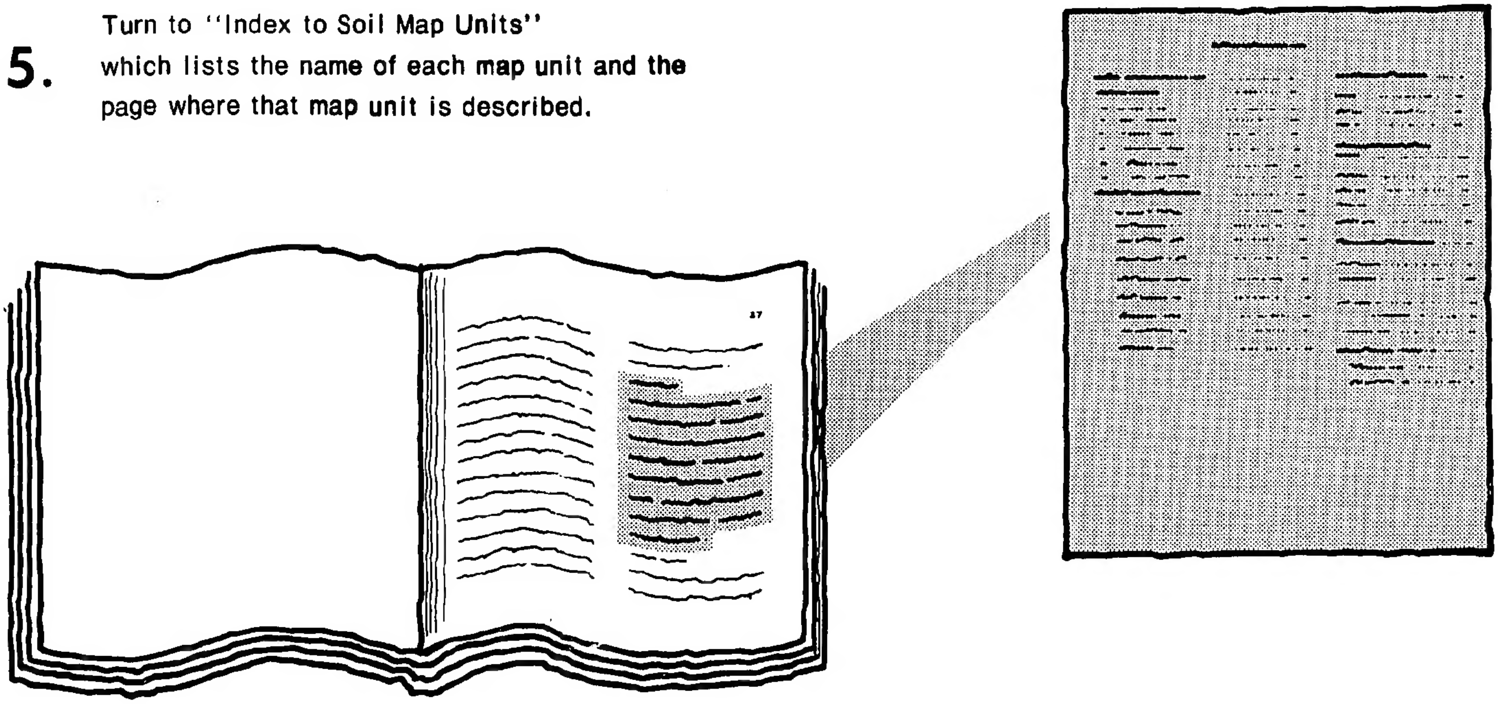
4. List the map unit symbols that are in your area.

Symbols

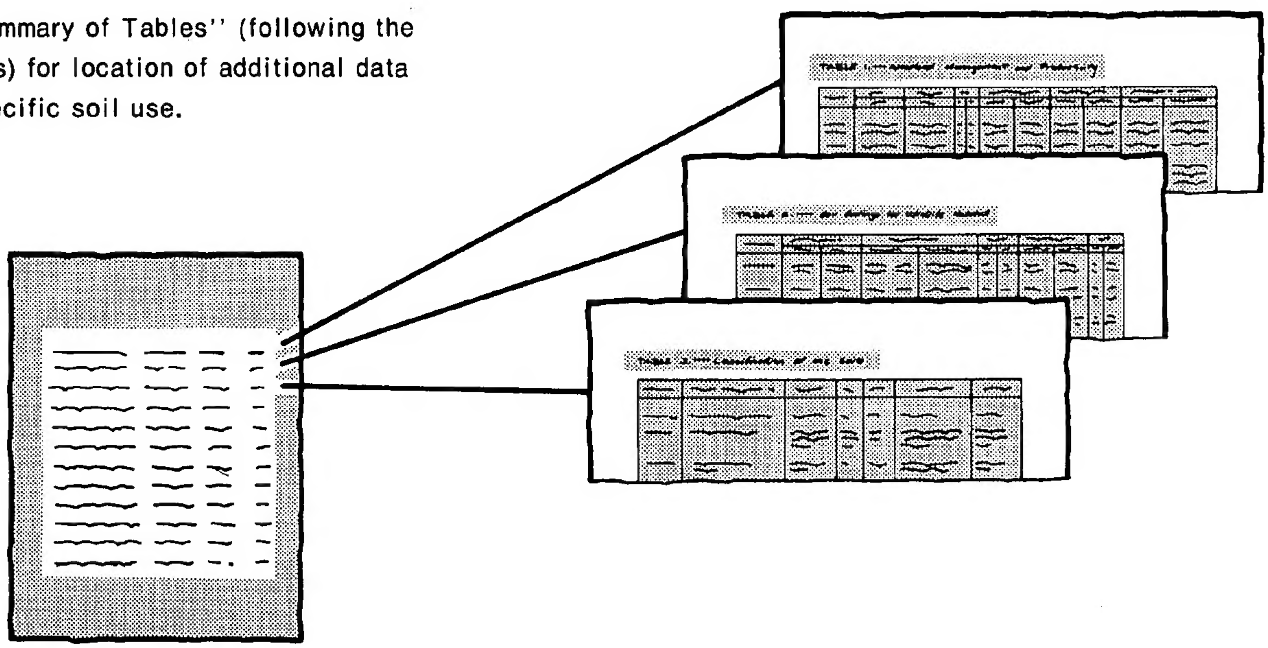


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Monroe County Soil and Water Conservation District. Financial assistance was made available by Monroe County Commissioners and the city of Bloomington. Major fieldwork was performed in the period 1972-77. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Alfalfa grows well on Ryker silt loams. Slopes range from 2 to 12 percent.

contents

soil series

Issued May 1981

index to map units

summary of tables

foreword

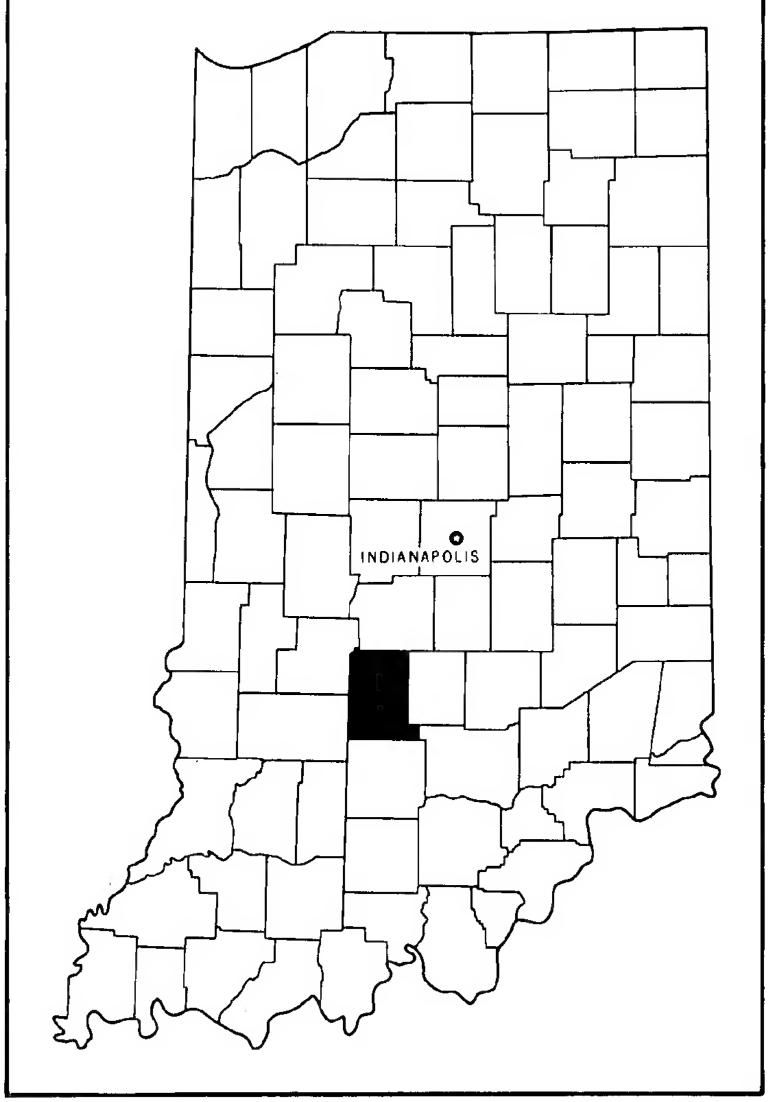
This soil survey contains information that can be used in land-planning programs in Monroe County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Buell M. Ferguson
State Conservationist
Soil Conservation Service



Location of Monroe County in Indiana.

Soil Survey of
Monroe County, Indiana

Survey by Jerry A. Thomas, Soil Conservation Service
Fieldwork by Jerry A. Thomas and Robert C. Wingard, Jr.
Soil Conservation Service
Phillip A. Kempf
Indiana Department of Natural Resources, Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Purdue University Agricultural Experiment Station and
Indiana Department of Natural Resources, Soil and Water Conservation Committee

Monroe County is in the south-central part of Indiana. It covers a total area of 412 square miles, or 263,680 acres. There are 393 square miles, or 251,290 acres, of land and 19 square miles, or 12,390 acres, of water. The county extends about 24 miles from north to south and 18 miles from west to east. Bloomington, the largest city, is the county seat and the home of Indiana University. In 1970 it had a population of 42,890. In 1972 Monroe County had a population of 82,497. Businesses within the county employ a large share of the work force, about one-quarter of which is engaged in manufacturing.

Much of the county consists of uplands. Slopes range from nearly level to very steep. Many areas on bottom land along Bean Blossom Creek, Salt Creek, Clear Creek, and White River are subject to flooding. Terraces make up a large area along Bean Blossom Creek and are strongly sloping to steep.

general nature of the county

This section gives general information concerning Monroe County. It discusses settlement of the county, geology, natural resources, relief, agriculture, and climate.

settlement of the county

The county was named in honor of President James Monroe after it was created by an Act of the Indiana General Assembly in 1818. The present boundaries, however, were not established until 1836.

The first permanent settlement in the county is presumed to be that of David and Jonathan Riggs in the Bloomington area in 1816. Early settlements outside of the Bloomington area included Detham's grist mill, established on Clear Creek in 1818, and Shirley's grist mill, established below Shirley's Spring a few years later. The Virginia Iron Works was established in 1839 in Indian Creek Township. Indiana University was established in 1820 as a state seminary. It is said to be the second oldest major state university west of the Alleghenies.

The population of Monroe County was 20,783 in 1900; 23,426 in 1910; 35,974 in 1930; 50,080 in 1950; 59,225 in 1960; and 82,497 in 1972 (*8*).

Bloomington, the county seat, had a population of 6,460 in 1900; 8,838 in 1910; 18,227 in 1930; 28,163 in 1950; 31,357 in 1960; and 42,890 in 1970. Ellettsville, the largest town, has a population of 1,636. The county contains smaller communities, some of which are Chapel Hill, Clear Creek, Dolan, Handy, Harrodsburg, Kirksville, New Unionville, Smithville, Stanford, Stinesville, and Unionville.

geology

Henry H. Gray, head stratigrapher, geology section, Geological Survey, Indiana Department of Natural Resources, helped prepare this section.

The county is composed of three different topographic units. They are the Norman Upland, the Mitchell Plain, and the Crawford Upland. The rocks underlying these areas are Mississippian (approximately 250 million years) in age except for some of the capping sandstone in the Crawford Upland, which is Pennsylvanian (approximately 230 million years).

The Norman Upland is a severely dissected plain in the eastern part of the county, extending westward nearly to Harrodsburg, Smithville, Unionville, and Hindustan. The main divides are small flats and long narrow ridges, the crests of which represent remnants of old plains into which the creeks and their tributaries have cut V-shaped valleys from 200 to 400 feet deep. As a rule the stream bottoms are narrow and the slopes are rather steep. In some places the dissection has proceeded so far as to lower the divides from level-topped ridges to a series of high points, or knobs, with intervening low gaps. These hillsides have slopes that range from 18 to 75 percent. Siltstone and shale are the main types of rock. The Berks, Gilpin, Tilsit, Weikert, and Wellston soils are dominant on the Norman Upland.

The Mitchell Plain lies just west of the Norman Upland and extends a short distance west of Harrodsburg. It then goes north and northwest along an irregular boundary to the county line west of Ellettsville. This generally rolling plain has many sinkholes and some highly dissected areas along streams. Sinkholes are the most striking surface features of the Mitchell Plain. These depressions range from slight sags and watertight basins to huge hollows 50 feet or more deep. There are a few sinkholes into which creeks disappear throughout the area. In the eastern part of the Mitchell Plain, the sinkholes are few in number and the landscape is gently undulating without distinct gullies along the small streams. However, some of the larger streams have cut below the level of the general plain, exposing rocky, steep-sided, gorgelike valleys. Some of the roughest land in the county is an almost continuous area of short, steep slopes between the top of Kirksville Ridge and the Clear Creek valley floor. Limestone is the main type of rock. Bedford, Caneyville, Caneyville Variant, Corydon Variant, Crider, and Hagerstown soils are dominant on the Mitchell Plains.

The Crawford Upland includes the remainder of the county west of the Mitchell Plain. Like the Norman Upland it is a dissected plain, but the ridgetops are broader and more rounded, the hillsides are more gentle, and the valleys are broader. The drainage is not so complete, and some streams which begin in the hills disappear into sinkholes when they reach the valleys. Kirksville Ridge forms the eastern margin of this upland, rising as a distinct escarpment above the Mitchell Plain. Sandstone, shale, and limestone are the main rock types in this area. The Ebal, Gilpin, Tilsit, Wellston, and Zanesville soils are dominant.

The northern border of Monroe County is in the glaciated section of the state, but the glacial action here was too feeble to modify the pre-existing physiographic features to any great extent. The glacier that covered the northwest part of the county was Illinoian (approximately 120,000 years ago) or older. It left deposits of till and outwash sand as well as the lake deposits. One effect of the glaciers was the formation of terraces beyond the limits of the ice sheets, where the glacial waters escaped through the valleys of Bean Blossom and Salt Creeks. West of Ellettsville is a large, rather flat area called "Glacial Lake Flatwoods," which was formed at the margin of the glacier. In this area the Alford, Chetwynd, Hickory, Parke, Peoga, Princeton, Ryker, Zipp, and Zipp Variant soils are dominant.

The loess cap that covers almost all of the county appears to be Wisconsian (approximately 20,000 years) in age. The loess appears to be deepest in the northwest part of the county. The dominant loess soils are Alford, Hosmer, and Iva.

Monroe County lies between the two forks of the White River, which receive all the drainage waters of the county. Although the west fork touches the northwestern corner of the county and is the outlet for Bean Blossom Creek, the greater portion of the area drains through Salt and Indian Creeks to the East Fork of the White River. The crest of the divide between these forks lies across the county close to the route of the major railroad. Both Salt and Bean Blossom Creeks have rather deep channels and meander through flat bottom lands that are from 1/4 to 1 1/2 miles wide and several hundred feet below the adjoining uplands. The lower course of Bean Blossom Creek has been narrowed by a glacial bar across its valley, and the actual stream channel becomes very deep as it cuts through the high White River bottoms. Moores Creek is typical of the small streams of the Norman Upland—many branches and steep draws extend in all directions and have steep slopes near their heads. The upper reaches of Clear and Indian Creeks are comparatively shallow draws in gently undulating terrain, and the slopes are more uniform and gentle. Clear Creek has underground tributaries which drain sinkhole areas and emerge as springs. Also some small streams west of Bloomington pass underground and flow out into the Richland Creek Valley.

natural resources

Soil is the most important natural resource in the county. Livestock that graze the grassland and crops that are produced on farms are marketable products derived from the soil. Timber production is another large industry. Approximately 47 percent of the county is in woodland. The limestone industry is the oldest industry in the area. The building-stone quarries and mills in the

Bloomington-Bedford limestone belt are unique and the largest such operations in the world. A large part of the Nation's building stone is quarried here. The stone industry is the third largest employer in the county (*5*).

relief

The average elevation of Monroe County is about 760 feet above sea level. The highest elevation is 995 feet, and the lowest is 490 feet. The local relief, or difference in elevation, measures up to 300 feet along Salt, Bean Blossom, and Richland Creeks. The Kirksville, Stanford, and Unionville Ridges rise to an elevation of about 900 feet, and the Mitchell plain is between 700 and 800 feet (*4*).

agriculture

During the settlement of Monroe County, the pioneers established scattered settlements along the major streams on the most favorable soils. After all of these soils were taken up, they began clearing the moderately steep and steep land. During this period lumbering became almost as important as farming. The virgin soils produced excellent crops. In the steeper areas productive surface soil was lost through erosion, and, as a result, crop yields were reduced within a few years. These areas were abandoned to brush. Later, many acres of the gently sloping to sloping soil were also abandoned because of depleted fertility and soil erosion. The farmers often moved away, leaving the areas for nature to salvage by natural reforestation. Today, many of these areas are covered by stands of timber that are of good to excellent quality. Some of the abandoned areas were later reclaimed during periods when farm prices were high. When farm prices decreased during the 1930's and when the area became more depleted, many tracts of land were again abandoned.

Many farmers were content to live on farms of 40 to 100 acres for years. Meanwhile, the standard of living was improving. To achieve this higher standard of living, these small farmers had to acquire more land or intensify their farming systems. On farms that had a large amount of marginal cropland, intensified farming caused a rapid depletion of soil fertility and a rapid increase in soil erosion. Many farmers left their farms for other employment, and some farms were abandoned. Many farms that were left idle are now covered with broom sedge and briers (*6*).

Poor farming methods and soil erosion also caused some damage to the better, nearly level to gently sloping cropland. Recognizing the need for help with their soil erosion problems, the farmers voted in 1943 to form the Monroe County Soil and Water Conservation District. The district, with the aid of the Soil Conservation Service and other agencies, provides technical assistance to the farmers on soil and water conservation problems.

Since the organization of the District, several thousand acres have been protected from excessive erosion. Each year, conservation practices are applied to many additional acres. Several thousand acres of forest also have been protected.

Size of farms increased from 40 to 80 acres in the late 1800's to an average size of 143.5 acres in 1969. There are some specialized farms, but most are general farms. In 1969 about 76 percent of the farmers worked away from their farms for additional income (*10*).

About 50,000 acres, or 20 percent of the county, is cropland. Of this, about 20,000 acres of hay and pasture are used in a rotation system. About 36,000 acres, or 15 percent of the county, is in permanent pasture, and 110,000 acres, or 45 percent, is in woodland.

A committee studying conservation needs estimated that the use of farmland in the county is: 49,816 acres of cropland, 36,146 acres of pasture, and 110,000 acres of forest. Estimates indicate that about 52 percent of the cropland needs some treatment to protect the soils—either erosion control or drainage. Approximately 85 percent of the pasture also needs treatment (*3*).

The number of farms in the county decreased from 2,232 in 1920 to 585 in 1974. The average size of farms and the average value per acre, however, have increased. The amount of farm income derived from the sale of livestock, livestock products, and forest products has increased (*6*).

climate

In Monroe County, summers are hot in the valleys and slightly cooler in the hills; winters are moderately cold. Rains are fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but the snow cover generally lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Bloomington, Indiana, for the period 1951 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 32 degrees F, and the average daily minimum temperature is 23 degrees. The lowest temperature on record, which occurred at Bloomington on January 24, 1963, is -16 degrees. In summer the average temperature is 74 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 105 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 24 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years

out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 4.85 inches at Bloomington on June 23, 1960. Thunderstorms occur on about 45 days each year, and most occur in summer.

Average seasonal snowfall is 8 inches. The greatest snow depth at any one time during the period of record was 9 inches. On the average, 4 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 65 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The percentage of possible sunshine is 70 in summer and 45 in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

Climatic data for this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, specialty crops, woodland, urban uses,* and *recreation areas.* Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and as wilderness.

Soil map units and delineations on the general soil map in this survey do not fully agree with those of the general soil maps in adjacent counties published at a different date. Differences in the maps are the result of improvements in the classification of soils, particularly in the modifications or refinements in soil series concepts. In addition more precise and detailed maps are needed because the uses of the general soil maps have expanded in recent years. The more modern maps meet this need. Still another difference is caused by the range in slope that is permitted within map units in different surveys.

soil descriptions

1. Berks-Weikert

Moderately deep and shallow, steep and very steep, well drained soils formed in residuum from sandstone, siltstone, and shale; on uplands

This map unit is a deeply dissected plain on which the main divides are small flats and long narrow ridges. The soils in this unit are on side slopes of ridges along drainageways that dissect the upland areas, and they are on sharp slope breaks that border the valleys. The areas are large and are separated only by long and narrow stream bottoms and by terraces. Slopes range from 25 to 75 percent.

This map unit covers about 39 percent of the county. About 33 percent is Berks soils, 33 percent is Weikert soils, and the remaining 34 percent is soils of minor extent.

Berks soils are steep and very steep, moderately deep, and well drained. They have a surface layer of brown silt loam. The subsoil is yellowish brown and brown channery and very channery silt loam. The substratum is strong brown very channery silt loam. Bedrock is at a depth of about 38 inches.

Weikert soils are steep and very steep, shallow, and well drained. They have a surface layer of brown shaly silt loam. The subsoil is brown and dark yellowish brown shaly and very shaly silt loam. Bedrock is at a depth of about 15 inches.

The minor soils in this unit are the well drained Wellston, Gilpin, Caneyville Variant, Corydon Variant, and Crider soils and the moderately well drained Bedford soils. The Wellston and Gilpin soils are on narrow ridgetops. The Crider and Bedford soils are moderately deep to a fragipan and are on the tops of broader ridges that are underlain by a thin layer of limestone bedrock over sandstone bedrock. The Caneyville Variant and Corydon Variant soils are on the upper one-third of the side slopes where limestone bedrock is in contact with sandstone bedrock.

The soils in this map unit are used mainly for woodland. They are generally unsuited to cultivated

crops because of the very severe hazard of erosion, steepness of slope, and depth to bedrock. The soils in this unit are suitable for trees but are limited by coarse fragments, steepness of slope, and depth to bedrock. Steepness of slope and depth to bedrock are severe limitations so difficult to overcome that these soils are generally unsuitable for building sites, sanitary facilities, and intensive recreational development.

2. Crider-Caneyville

Deep and moderately deep, gently sloping to strongly sloping, well drained soils formed in loess and residuum from limestone; on uplands

This map unit is mainly a rolling plain that has some sinkholes and some highly dissected areas along streams. Sinkholes are the most striking surface feature of this unit. They range from slight sags and watertight basins to huge hollows 50 feet or more deep. Drainageways disappear into a few of these sinkholes. In the eastern part of this unit, the sinkholes are few in number, and the landscape is gently undulating without distinct gullies along the small streams. Some of the larger streams have cut below the level of the general plain to form rocky, steep-sided, gorgelike valleys. Slopes range from 2 to 18 percent.

This map unit covers about 30 percent of the county. About 50 percent is Crider soils, 20 percent is Caneyville soils, and the remaining 30 percent is soils of minor extent.

Crider soils are gently sloping to strongly sloping, deep, and well drained. They are on the upper part of the side slopes and convex ridgetops. Some areas have sinkholes, but only a few areas are generally considered to have karst topography. These soils have a surface layer of dark brown silt loam. The subsoil is brown, strong brown, and yellowish red silty clay loam in the upper part and red clay in the lower part. Bedrock is at a depth of 67 inches.

Caneyville soils are strongly sloping, moderately deep, and well drained. They are on the lower part of the side slopes. They have a surface layer of very dark grayish brown and dark grayish brown silt loam. The subsoil is strong brown silt loam and silty clay loam in the upper part and yellowish red and brown silty clay in the lower part. Bedrock is at a depth of about 35 inches.

The minor soils in this unit are the well drained Hagerstown, Burnside, Corydon Variant, and Caneyville Variant soils and the moderately well drained Bedford soils. The Bedford soils have a fragipan and are in the flat or depressional areas of the broader ridgetops. The Hagerstown soils are on the upper one-half of the side slope. The Corydon Variant and Caneyville Variant soils are on the lower one-half of the side slope. The Burnside soils are on long, narrow stream bottoms that dissect the area. In the karst regions of this map unit there is a higher percentage of Caneyville and Hagerstown soils.

The soils of this map unit are used mainly for cultivated crops. Some soils are used for hay or pasture, and a few are in woodland. Most of the soils in the karst regions are used for hay or pasture.

The soils in this unit are generally suited to cultivated crops but are limited by slope and the hazard of erosion. In places, they are also limited by the depth to rock. In the karst regions the sinkholes are the major limitation.

These soils are dominantly suited to trees, but in places the amount of clay in the upper part of the soil becomes a limitation.

These soils are suitable for building sites and sanitary facilities but are limited by steepness of slope. In places, they are also limited by depth to rock.

These soils are suitable for intensive recreational development but are limited by slope.

3. Ebal-Gilpin-Tilsit

Deep and moderately deep, nearly level to moderately steep, moderately well drained and well drained soils formed in loess, colluvium, and residuum from shale, sandstone, and siltstone; on uplands

This map unit is a single large area. It is a dissected plain on which the main divides are broad, rounded ridgetops, the stream bottoms are broad, and the hillsides are moderately sloping to moderately steep. Some drainageways begin on the hillsides and disappear into sinkholes when they reach the valley floor. Slopes range from 0 to 25 percent.

This map unit covers about 11 percent of the county. About 30 percent is Ebal soils, 15 percent is Gilpin soils, and 15 percent is Tilsit soils. The remaining 40 percent is soils of minor extent.

Ebal soils are strongly sloping and moderately steep, deep, and moderately well drained. They occur in scattered positions on the side slopes of the unit. They are small benchlike slips directly below the steeper soils that have rock outcrops. Ebal soils have a surface layer of dark grayish brown silt loam. The subsoil is yellowish brown silt loam and channery silty clay loam in the upper part; yellowish brown, mottled channery silty clay in the middle part; and red and yellowish brown, mottled clay in the lower part. Gray shale is at a depth of about 61 inches.

Gilpin soils are strongly sloping, moderately deep, and well drained. They occur in scattered positions on the side slopes of the unit. They have a surface layer of yellowish brown and dark yellowish brown silt loam. The subsoil is yellowish brown and strong brown silt loam in the upper part and strong brown channery silt loam in the lower part. Bedrock is a depth of about 28 inches.

Tilsit soils are nearly level and gently sloping, moderately well drained, and moderately deep to a fragipan. They are on broad, convex ridgetops of the loess-covered uplands. They have a surface layer of brown silt loam. The subsoil is yellowish brown silty clay loam in the upper part; mottled yellowish brown and light

brownish gray silty clay loam in the middle part; and mottled brown, yellowish brown, light brownish gray, and gray channery silty clay loam in the lower part. Bedrock is at a depth of 58 inches.

The minor soils in this unit are the well drained Wellston, Zanesville, Burnside, and Crider soils and the moderately well drained Pekin soils. The Wellston soils are deep, and the Zanesville soils are moderately deep to a fragipan, and both soils are on the upper part of the side slopes. The Pekin soils are at the base of the side slopes and on small bench terraces along the valley floor. The Burnside soils are on the lower end of the drainageways where they enter the valley floor. The Crider soils are on side slopes below the breaks where exposed sandstone, siltstone, or shale bedrock is in contact with limestone bedrock.

The soils of this map unit are used mainly for woodland, but in some areas they are used for hay or pasture. A few areas are used for cultivated crops. The Ebal and Gilpin soils in this unit are generally unsuited to cultivated crops because of slope and the hazard of erosion. The Tilsit soils are suited to cultivated crops but are limited by a fragipan.

Steepness of the slope and the shrinking and swelling of clay shale are limitations that are so difficult to overcome that these soils are generally unsuitable for building sites, sanitary facilities, and intensive recreational development. The nearly level and gently sloping soils have the most potential for building sites and sanitary facilities, but they are limited by wetness.

4. Haymond-Stendal

Deep, nearly level, well drained and somewhat poorly drained soils formed in alluvium; on flood plains

This map unit is on the broad, nearly level bottom land along meandering streams. Areas are generally variable in size and shape and are scattered throughout the county. Slopes range from 0 to 2 percent.

This map unit covers about 9 percent of the county. About 29 percent is Haymond soils, 17 percent is Stendal soils, and the remaining 54 percent is soils of minor extent.

Haymond soils are nearly level, deep, and well drained. They are on broad flats and in narrow areas of bottom land along streams. They formed in medium acid to neutral alluvium washed from loess-covered limestone uplands. They have a surface layer of dark brown and dark grayish brown silt loam. The substratum is dark brown and yellowish brown silt loam.

Stendal soils are nearly level, deep, and somewhat poorly drained. They are on broad flats and in narrow areas of bottom land along streams. They formed in acid alluvium derived from loess-covered sandstone, siltstone, and shale uplands. They are in the more depressional areas, in swales, and along poorly defined drainageways. They have a surface layer of brown silt loam. The subsoil is light brownish gray, mottled silt loam in the upper part and pale brown, mottled silt loam in the lower part. The substratum is light brownish gray, mottled silt loam.

The minor soils in this unit are the well drained Elkinsville, Cuba, and Burnside soils; the moderately well drained Pekin and Steff soils; the somewhat poorly drained Wakeland soils; and the poorly drained Bonnie soils. The Elkinsville and Pekin soils are moderately deep to a fragipan and are on small bench terraces along the valley floors. The Cuba and Steff soils are on the higher broad flats and slight rises in the landscape. The Bonnie soils are on the lower broad flats and in depressions. The Burnside soils are in long, narrow areas of bottom land along streams that dissect the map unit. The Wakeland soils are on lower broad flats on bottom land and in long narrow areas along streams that dissect the map unit.

The soils in this map unit are used mainly for cultivated crops. Some of the soils are used for hay, pasture, or woodland.

These soils are suited to cultivated crops but are limited by the frequent flooding early in spring. The Stendal soil is also limited by wetness. These soils are suited to trees but are limited by flooding. Frequent flooding is a severe limitation and is so difficult to overcome that the soils are generally unsuitable for building sites and sanitary facilities. These soils are suited to intensive recreational development, but they are limited by flooding.

5. Ryker-Hickory

Deep, gently sloping to very steep, well drained soils formed in loess, glacial till, and residuum from limestone; on uplands

This map unit is a single medium sized area in the glaciated section of the county where glacial action did not modify the preexisting physiographic features to any great extent. It is on ridges along drainageways. Slopes range from 2 to 75 percent.

This map unit covers about 6 percent of the county. About 16 percent is Ryker soils, 15 percent is Hickory soils, and the remaining 69 percent is soils of minor extent.

Ryker soils are gently sloping to strongly sloping, deep, and well drained. They are on convex ridgetops and the upper part of side slopes on uplands. In these areas there are some sinkholes, but only a few are generally considered karst topography. These soils have a surface layer of dark brown and dark yellowish brown silt loam. The subsoil is strong brown silt loam and silty clay loam in the upper part, yellowish red clay loam in the middle part, and yellowish red clay in the lower part. Bedrock is at a depth of about 78 inches.

Hickory soils are steep and very steep, deep, and well drained. They are on the lower part of the upland side slopes. They have a surface layer of dark grayish brown and very dark brown silt loam. The subsurface layer is

brown silt loam. The subsoil is yellowish brown loam in the upper part, yellowish brown clay loam in the middle part, and strong brown clay loam in the lower part. The substratum is yellowish brown loam.

The minor soils in this unit are the well drained Caneyville, Hagerstown, Chetwynd, and Parke soils, the well drained and moderately well drained Hosmer soils, and the somewhat poorly drained Iva soils. The moderately deep Caneyville soil and the deep Hagerstown soil have karst topography. The Chetwynd soils are on the steeper part of the side slopes. The Parke, Iva, and Hosmer soils are moderately deep to a fragipan and are on the broader, nearly level to moderately sloping ridgetops.

The soils in this unit are used mainly for woodland, but in some areas they are used for hay or pasture. Where slopes are only 12 to 18 percent, the soils are suitable for cultivated crops but are limited by the hazard of erosion and the steepness of slope. The steeper soils are unsuited to cultivated crops because of the very severe hazard of erosion, steepness of slope, and karst topography. The soils in this unit are dominantly suitable for trees, but the steeper soils are limited by slope. Steepness of slope is a severe limitation and is so difficult to overcome that the soils are generally unsuitable for building sites, sanitary facilities, and intensive recreational development.

6. Hosmer-Crider

Deep, nearly level to moderately sloping, well drained and moderately well drained soils formed in loess and residuum from limestone, sandstone, siltstone, and shale; on uplands

This map unit is a single medium-sized area. It is mainly a loess-covered upland plain that includes some sinkholes and some dissected land along drainageways. The thickness of the loess cap is the most striking surface feature of this unit. Slopes range from 0 to 12 percent.

This map unit covers about 4 percent of the county. About 60 percent is Hosmer soils, 15 percent is Crider soils, and the remaining 25 percent is soils of minor extent.

Hosmer soils are nearly level to moderately sloping and well drained and moderately well drained. They are moderately deep to a fragipan. They are on both narrow and broad ridgetops and on side slopes of loess-covered uplands. They have a surface layer of dark grayish brown silt loam. The subsoil is yellowish brown silt loam in the upper part, is a strong brown and brown silt loam fragipan in the middle part, and is yellowish brown and strong brown, mottled silt loam in the lower part. The substratum is reddish yellow, mottled silt loam.

Crider soils are gently sloping and moderately sloping, deep, and well drained. They are on both narrow and broad convex ridgetops of the uplands. They have a surface layer of dark brown silt loam. The subsoil is brown silty clay loam in the upper part, strong brown and yellowish red silty clay loam in the middle part, and red clay in the lower part. Bedrock is at a depth of about 67 inches.

The minor soils in this unit are the well drained Hagerstown soils and the somewhat poorly drained Iva and Bartle soils. The Hagerstown soils are deep and are on the steeper slopes. The Iva soils are deep and are in the flat or depressional areas on ridgetops. The Bartle soils are moderately deep to a fragipan and are on small bench terraces along the valley floors.

These soils are used mainly for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

The soils in this unit are dominantly suited to cultivated crops but are limited by slope and the hazard of erosion. In places, they are also limited by a very slowly permeable fragipan. These soils are suitable for trees. They are generally suitable for building sites, sanitary facilities, and intensive recreational development but are limited by steepness of slope. In places, their use for building sites and sanitary facilities is also limited by a fragipan.

7. Peoga-Bartle

Deep, nearly level, poorly drained and somewhat poorly drained soils formed in loess and lakebed sediments or in old alluvium; on uplands

This map unit occurs as a single small area in the glaciated section of the county. This area was an old glacial lake at the margin of the glacier. It is a nearly level lake plain surrounded by steeper uplands. Slopes range from 0 to 2 percent.

This map unit covers about 1 percent of the county. About 45 percent is Peoga soils, 18 percent is Bartle soils, and the remaining 37 percent is soils of minor extent.

Peoga soils are nearly level, deep, and poorly drained. They are on broad glacial lake plains and on low alluvial terraces. They have a surface layer of grayish brown silt loam. The subsurface layer is light gray, mottled silt loam. The subsoil is gray, mottled silt loam in the upper part; gray, mottled silty clay loam in the middle part; and dark gray, mottled silty clay loam in the lower part.

Bartle soils are nearly level and somewhat poorly drained. They are moderately deep to a fragipan. They are on broad silt-covered terraces which have short slopes adjacent to drainageways. They are also on the higher lying flats and slight rises on the lake plain. They have a surface layer of dark brown silt loam. The subsoil is pale brown and light brownish gray, mottled silt loam in the upper part, and it is a fragipan of light brownish gray and gray, mottled silt loam in the lower part. The substratum is gray, mottled, stratified silty clay loam and silt loam.

The minor soils in this unit are the well drained Caneyville, Parke, and Ryker soils, the well drained and

moderately well drained Hosmer soils, the moderately well drained Steff soils, the poorly drained Bonnie soils, and the very poorly drained Zipp soils. The Caneyville, Parke, and Ryker soils are on the side slopes of the adjoining uplands. The Hosmer soils are on adjoining upland positions and on slight rises on the lake plain. The Steff soils are on slight rises on the lake plain. The Bonnie and Zipp soils are in the more depressional areas.

The soils in this unit are used mainly for cultivated crops, but in some areas they are used for hay, pasture, or woodland. These soils are suitable for cultivated crops and trees but are limited by a seasonal high water table. In places, they are also limited by a very slowly permeable fragipan. Wetness and the fragipan are limitations that are so difficult to overcome that the soils are generally unsuitable for building sites, sanitary facilities, and intensive recreational development.

broad land use considerations

Deciding which land should be used for urban development is an important issue in the survey area. Each year a considerable amount of land is being developed for urban uses in Bloomington, Perry, and Richland townships. Benton and Polk townships have the smallest amount of urban development. It was estimated that in 1967 there were about 38,508 acres of urban and built-up land in the county; this figure has been growing at the rate of about 500 acres per year. The general soil map is most helpful for planning the general outline of urban areas; it cannot be used for the selection of sites for specific urban structures. The data about specific soils in this survey area can be helpful in planning future land use patterns.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hagerstown silty clay loam, 12 to 22 percent slopes, severely eroded, is one of several phases in the Hagerstown series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Berks-Weikert complex, 25 to 75 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimilar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Pits part of the Udorthents-Pits complex is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

AfB—Alford silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on narrow, convex ridgetops of the loess-covered uplands. Areas are generally long and narrow. They range from 3 to 60 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsoil is about 48 inches thick. It is yellowish brown, friable silt loam in the upper part; yellowish brown, friable to firm silty clay loam in the middle part; and yellowish brown, friable silt loam in the lower part. The substratum to a depth of 70 inches or more is yellowish red silt loam. In some places, glacial till is within a depth of 3 feet. Also in some areas the loess cap is 3 to 4 feet thick, and the soil has more clay in the lower part of the solum.

Included with this soil in mapping are a few depressional areas of somewhat poorly drained Iva soils and some small areas of well drained Bedford and Hosmer soils on the same landform. Bedford and Hosmer soils have a fragipan. Also, some severely eroded areas are on nose slopes and on sharp slope breaks. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Alford soil is very high, and the permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is moderate.

Many areas of this soil are used for hay or pasture, and some are used for cultivated crops. A few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are

grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is especially good for alfalfa and other deep rooted legumes. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and without basements because of shrinking and swelling. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of potential frost action and low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Limitations are slight for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

Ba—Bartle silt loam. This nearly level, somewhat poorly drained soil is moderately deep to a fragipan. It is on broad terraces adjacent to drainageways. Areas are generally long and narrow. They range from 3 to 40 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 38 inches thick. It is pale brown, mottled, friable silt loam in the upper part; light brownish gray, mottled, friable silt loam in the middle part; and is a fragipan of light brownish gray and gray, mottled, very firm and brittle silt loam in the lower part. The substratum to a depth of 60 inches or more is gray, mottled silty clay loam and silt loam. In some areas the fragipan is at a depth of less than 24 inches. In other areas the soil has less sand in the lower part of the solum.

Included with this soil in mapping are a few small depressional areas of poorly drained Peoga soils and small steeper areas of well drained Elkinsville and moderately well drained Pekin soils. The Elkinsville and Peoga soils do not have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Bartle soil is moderate, and permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate.

This soil has a seasonal high water table at a depth of 1 to 2 feet from January to April. Because the fragipan is at a depth of 24 to 36 inches, root penetration is restricted and the water table is perched.

Many areas of this soil have been drained and are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

If adequately drained, this soil is suited to corn, soybeans, and small grain. Wetness is the main concern in the use and management of this soil. It is wet and seepy in spring, but may become droughty late in summer. Soil tilth is often improved by the freeze-thaw action of the soil during the winter. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also improve and help maintain tilth and organic matter content. Frost and water damage can be reduced with the use of short-season varieties of adapted crops.

If adequately drained, this soil is suited to grasses and water-tolerant legumes for hay or pasture. Wetness restricts its use for most legumes. This soil is poorly suited to deep rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees, but only a few areas are in woodland. Plant competition is the main concern in management. A fragipan limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites because of wetness. It would be better to select an alternate site. If this soil is used for dwellings, it must be artificially drained. Dwellings should be constructed without basements. Foundation drains, landscaping to remove runoff, and drainage ditches lower the water table and keep wetness from becoming a serious problem. Disturbed areas should be revegetated as soon as

possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of potential frost action. Drainage ditches are needed along roads to lower the water table and help prevent damage from frost action. The limitation for septic tank absorption fields is also severe because of wetness and the very slowly permeable fragipan. It would be better to select an alternate site.

This soil is in capability subclass IIw and woodland suitability subclass 3o.

BdB—Bedford silt loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is moderately deep to a fragipan. It is on narrow to broad ridgetops of the loess-covered uplands. Areas are generally narrow and long. They range from 3 to 100 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of about 80 inches. It is yellowish brown, friable silt loam and silty clay loam in the upper part; has a fragipan of strong brown and brown, mottled, firm to very firm and brittle silty clay loam in the middle part; and is multicolored, firm silty clay loam and silty clay in the lower part. In places, the fragipan is within a depth of 20 inches. In some areas the subsoil contains some chert and geodes. In other places, the loess cap is more than 50 inches thick.

Included with this soil in mapping on the broader areas of the unit are a few depressional areas of somewhat poorly drained Iva soils. On the small flats are small areas of less sloping Bedford soils and well drained Crider soils. On the more sloping part of the unit are small areas of well drained Caneyville, Crider, and Hagerstown soils. The Caneyville, Crider, Hagerstown, and Iva soils do not have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Bedford soil is moderate, and permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low. The soil has a seasonal high water table at a depth of 2 to 4 feet during March and April. Because the fragipan is at a depth of 20 to 36 inches, root penetration is restricted and the water table is perched.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil, and the very slowly permeable fragipan also affects use and management. This soil is wet and seepy in spring, but may become droughty late in summer. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the soil surface, terraces, diversions, contour farming, grassed waterways, or grade-stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay and pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees, but only a few areas are in woodland. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is moderately limited for dwellings without basements because of wetness and shrinking and swelling. It is severely limited for dwellings with basements because of wetness. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. Foundation drains, landscaping to remove runoff, and drainage ditches lower the water table and keep wetness from becoming a serious problem. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion during construction. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets by potential frost action and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Drainage ditches lower the water table and help prevent damage from frost action. The limitation is severe for septic tank absorption fields because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIe and woodland suitability subclass 3o.

BkF—Berks-Weikert complex, 25 to 75 percent slopes. This complex consists of steep and very steep,

moderately deep and shallow, well drained soils on side slopes of the uplands. It is about 45 percent Berks soils and 40 percent Weikert soils. Areas are generally long and narrow. They range from 10 to 1,000 acres and have a dominant size of about 150 acres. Berks soils are generally on the upper half of the landform or in areas of 25 to 45 percent slopes. They also are on small benchlike slips in the steeper areas throughout the landform. Weikert soils are in the more sloping lower areas. The Berks and Weikert soils in the complex are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Berks soil, the surface layer is brown silt loam about 4 inches thick. The subsoil is about 18 inches thick. It is yellowish brown, friable channery silt loam in the upper part and brown, friable very channery silt loam in the lower part. The substratum, which extends to a depth of 38 inches, is strong brown very channery silt loam. Sandstone bedrock is at a depth of 38 inches. Some small areas have more clay in the subsoil. In places, the soil is deeper to bedrock, and the lower part of the subsoil is clay shale.

In a typical profile of the Weikert soil, the surface layer is brown shaly silt loam about 6 inches thick. The subsoil is about 9 inches thick. It is brown and dark yellowish brown, friable very shaly silt loam in the upper part and dark yellowish brown, friable very shaly silt loam in the lower part. Soft, dark yellowish brown siltstone (shale) bedrock is at a depth of 15 inches. In some small areas the surface layer is less than 30 percent coarse fragments. In places, bedrock is within a depth of 10 inches.

Included with this complex in mapping are small areas of well drained Caneyville Variant, Corydon Variant, Gilpin, and Wellston soils. The Caneyville Variant and Corydon Variant soils formed in limestone residuum. The narrow ridgetops are generally less than 200 feet in width and are dominantly Gilpin and Wellston soils. The Caneyville Variant and Corydon Variant soils only occur at the breaks where the exposed limestone bedrock is in contact with the sandstone bedrock. The Gilpin and Wellston soils have an argillic horizon. In places, these soils contain large amounts of chert and geodes, which are the remnants of the thin layer of limestone bedrock that is underlain by sandstone, siltstone, or shale. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity is low in the Berks soil and very low in the Weikert soil. The permeability is moderate or moderately rapid in the Berks soil and moderately rapid in the Weikert soil. Surface runoff of both soils is very rapid. The organic matter content of the surface layer is moderate in both soils.

These soils are not suited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Well established native grasses grow well in areas covered by a limited tree canopy. These soils are suitable for limited grazing. Major concerns of management are overgrazing and grazing when these soils are too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition. If rainfall is less than normal or is poorly distributed, these soils become somewhat droughty and grasses can be damaged.

Many areas are used as woodland. These soils are poorly suited to trees. Woodland is the best use of this unit, but it does not produce high quality woods. Erosion hazard, equipment limitation, and seedling mortality are concerns in management. The depth to bedrock limits the number of trees that will survive. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, these soils are not suited to black walnut plantings.

These soils are severely limited for dwellings without basements because of slope. This unit dominantly is severely limited for dwellings with basements because of slope or depth to bedrock. The selection of an alternate site may be necessary. Building designs should take into account the shallowness to rock. During construction the surface should not be exposed for long periods. Cover crops should be planted as soon as possible. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This unit is severely limited for local roads and streets because of slope. Placing the roads on the contour can help offset this limitation. Cutting and filling may be necessary, which can be limited by the depth to bedrock. This unit is severely limited for septic tank absorption fields and is generally not used for this purpose because of the steep and very steep slope and depth to bedrock.

This complex is in capability subclass VIIe. The woodland suitability subclass for the Berks soils is 3f and for the Weikert soils is 4d.

Bo—Bonnie silt loam. This nearly level, deep, poorly drained soil is on broad flats and depressions on bottom land. It is subject to frequent flooding for long periods from March to June. Areas are generally broad and irregular in shape. They range from 3 to 160 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is brown, mottled silt loam about 6 inches thick. The substratum to a depth of 28 inches is light brownish gray, mottled silt loam. Below this to a depth of 60 inches the substratum is mottled light brownish gray, yellowish brown, light yellowish brown, yellowish red, and dark red silt loam.

Some small areas are medium acid to neutral throughout. In places, the surface layer is more than 10 inches thick. A few areas of somewhat poorly drained soils are on the higher lying positions.

Included with this soil in mapping are small areas of the very poorly drained, frequently flooded Zipp soils on similar landscapes and small, slightly convex, higher areas of well drained Cuba and Haymond soils and moderately well drained Steff and Wilbur soils. The frequently flooded Zipp soils have more clay in their subsoil than the Bonnie soil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Bonnie soil is very high, and permeability is moderately slow. Surface runoff from cultivated areas is very slow. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 0 to 1 foot from March to June.

Many areas of this soil are used for cultivated crops and hay and pasture. Some areas are in woodland.

This soil is poorly suited to corn and soybeans because it is generally not adequately drained and is subject to frequent flooding. Small grain is also subject to severe damage during periods of prolonged flooding. Wetness and flooding are the main concerns in the use and management of this soil. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these. This soil is suited to intensive row cropping if it is drained and properly managed. Frost and flood damage can be reduced with the use of short season varieties of adapted crops. Late planting of crops helps to avoid damage or loss from flooding. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, crop residue management, and cover crops improve and help maintain tilth and organic matter content. Tillage of the soil when it is too wet results in large clods that become very firm when dry. Soil tilth is often improved by the freeze-thaw action of the soil during the winter.

This soil is suited to grasses and water-tolerant legumes for hay or pasture. It is generally not adequately drained and is subject to frequent flooding. This soil is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. The wetness of this soil also prohibits the use of most legumes.

When this soil is used for pasture, major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, rotational grazing, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Equipment limitation, seedling mortality, windthrow hazard, and plant competition are concerns in management. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites because of wetness and frequent flooding. It would be better to select an alternate site. It is severely limited for local roads and streets because of frequent flooding, wetness, and low strength. Drainage ditches remove excess water and lower the water table. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are also severe because of wetness, frequent flooding, and slow permeability. It would be better to select an alternate site.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

Bu—Burnside silt loam. This nearly level, deep, well drained soil is on narrow flood plains in sandstone bedrock areas. It is at the upper end of drainageways. It is subject to occasional flooding from March to June for brief periods. Areas are generally narrow and elongated. They range from 5 to 60 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsoil is about 25 inches thick. It is dark yellowish brown, friable silt loam in the upper part and yellowish brown, friable channery and very channery silt loam in the lower part. The substratum extends to a depth of 44 inches. It is dark yellowish brown very channery silt loam. Sandstone bedrock is at a depth of 44 inches. In some small areas, the surface layer has more coarse fragments. In many small areas limestone, sandstone, siltstone, or shale bedrock is at a depth of 12 to 40 inches. Where this soil is associated with limestone bedrock, either on the side slopes or on the valley floor, the profile ranges from neutral to medium acid. In some areas, the soil has more fine sand throughout or has less than 35 percent coarse fragments in the subsoil.

Included with this soil in mapping are a few small areas of soils that have a darker colored surface layer. Also included are a few small areas of well drained Cuba and Haymond soils at the lower end of the drainageway. These soils have less coarse fragments in their subsoil than the Burnside soil. Most delineations include a drainageway that is covered with coarse fragments or has a solid bedrock bottom. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Burnside soil is moderate, and permeability is moderate. Surface runoff from cultivated areas is slow. This soil has a seasonal high water table at a depth of 3 to 5 feet from February to June. The organic matter content of the surface layer is low.

Many areas of this soil are used for hay or pasture. Some areas are used for cultivated crops, and a few are in woodland.

This soil is suited to corn, soybeans, and small grain. With proper management, this soil is suited to intensive row cropping. Flooding is the main concern in the use and management of this soil. Small grain planted in the fall is subject to severe damage during periods of prolonged flooding. Late planting of crops helps avoid damage or loss from flooding. Conservation tillage that leaves all or part of the crop residue on the surface and green manure crops help maintain and improve tilth and organic matter content.

This soil is suited to grasses and legumes for pasture or hay. This soil is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Occasional flooding hinders harvesting and logging operations and also the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling.

This soil is severely limited for building sites because of occasional flooding. It would be better to select an alternate site. It is severely limited for local roads because it is subject to occasional flooding. The limitation for septic tank absorption fields is also severe because of flooding and wetness. It would be better to select an alternate site for this purpose.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

CaD—Caneyville silt loam, 12 to 18 percent slopes. This strongly sloping, moderately deep, well drained soil is on side slopes of the uplands. Areas are generally elongated. They range from 3 to 200 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is very dark grayish brown and dark grayish brown silt loam about 5 inches thick. The subsoil is about 30 inches thick. It is strong brown, friable silt loam and silty clay loam in the upper part and yellowish red and brown, firm silty clay in the lower part. Limestone bedrock is at a depth of 35 inches. In many small areas, the subsoil is more clayey.

Included with this soil in mapping are a few small steeper areas where limestone bedrock is within 20 inches of the surface. Also included are areas of alluvial soils that are in the bottom of the sinkholes, and small areas of less sloping, well drained Crider and Hagerstown soils. Crider and Hagerstown soils are deeper to limestone bedrock than the Caneyville soil. Also included are small areas of severely eroded soils on sharp slope breaks. Most delineations have a few rock outcrops, a few sinkholes, or a few abandoned quarries. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity for this Caneyville soil is low, and permeability is moderately slow. Surface runoff from cultivated areas is rapid. The organic matter content of the surface layer is moderate.

Many areas of this unit are used for hay or pasture. Some areas are in woodland, and a few are used for cultivated crops.

This soil is generally unsuited to corn, soybeans, and small grain because of steepness of slope and the very severe hazard of erosion. The depth to limestone bedrock also is a severe limitation. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture. Deep rooted legumes may be restricted by depth to bedrock. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing keep the pasture and soil in good condition.

This soil is suited to trees. Erosion hazard, equipment limitation, and plant competition are concerns in management.

Woodland is the best use of this unit, but it does not produce high quality woods. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Unless logging roads are built on the contour, they cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for dwellings without basements because of slope. It is severely limited for dwellings with basements because of depth to rock and slope. Grading the soil and designing structures to complement the slope can offset the slope limitation. Building designs should take into account the depth to rock. During construction the surface should not be exposed for long periods. Cover crops should be planted

as soon as possible. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset this limitation. Cutting and filling may be necessary but may be limited by depth to rock. The limitation for septic tank absorption fields is severe. This soil is generally not used for this purpose because of depth to rock, slope, and moderately slow permeability. Increasing the size of the filter field helps compensate for the restricted permeability in those areas where the soil is deep enough to install an absorption field.

This soil is in capability subclass VIe and woodland suitability subclass 3c.

Cb—Caneyville-Hagerstown silt loams, karst. This complex consists of gently sloping to strongly sloping soils on ridgetops and side slopes on uplands in a karst or sinkhole region. These soils are moderately deep and deep and well drained. This unit is about 55 percent Caneyville soils and 35 percent Hagerstown soils. Areas are generally slightly elongated. They range from 3 to 200 acres and have a dominant size of about 20 acres. The topography, which was originally a gently sloping or moderately sloping landscape, now includes many large sinkholes. A few drainageways are in this unit. After a limited amount of water collects in sinkholes, it drains very rapidly. The sinkholes are separated by narrow ridgetops (fig. 1). The Caneyville and Hagerstown soils are so intermingled that they could not be shown separately at the selected scale for mapping.

In a typical profile of the Caneyville soil, the surface layer is dark yellowish brown silt loam about 5 inches thick. The subsoil is about 30 inches thick. It is strong brown, friable cherty silty clay loam in the upper part and red, firm very cherty clay in the lower part. Limestone bedrock is at a depth of 35 inches. In places, the soil is more clayey in the subsoil.

In a typical profile of the Hagerstown soil, the surface layer is dark grayish brown silt loam about 4 inches thick.

Figure 1.—Sinkholes were incorporated into the design of this golf course on the Caneyville-Hagerstown silt loams, karst.

The subsoil is about 40 inches thick. It is brown, friable silt loam in the upper part; strong brown, firm silty clay loam in the next part; mottled strong brown, red, and yellowish brown, firm clay in the next part; strong brown, firm clay in the next part; and yellowish red, firm clay in the lower part. Limestone bedrock is at a depth of 44 inches. In some places, depth to the clayey subsoil layer is greater. In places, the subsoil is less clayey.

Included with this complex in mapping are a few small areas of soils that have limestone bedrock within a depth of 20 inches, small areas of moderately well drained Bedford soils and well drained Crider soils that are on the narrow ridgetops, small areas of well drained Haymond soils and moderately well drained Wilbur soils that are in the bottom of the sinkholes, and small areas that are severely eroded on sharp slope breaks. The Bedford soils have a fragipan, and the Crider soils are deeper to limestone bedrock than the Caneyville and Hagerstown soils. Inclusions make up about 5 to 10 percent of the unit.

The available water capacity is low in both soils. The permeability in the Caneyville soil is moderately slow, and it is moderate in the Hagerstown soil. Surface runoff from cultivated areas of both soils is medium. The organic matter content of the surface layer is moderate in both soils.

Many areas of these soils are used for hay or pasture. Some areas are used for cultivated crops, and a few areas are in woodland.

These soils are generally unsuited to corn, soybeans, and small grain. The ridgetops that can be cultivated make up only about 19 percent of the unit. The hazard of erosion is the main concern in the use and management of this soil. The depth to limestone bedrock also is a severe limitation. Conservation practices are needed to control erosion and surface runoff where cultivated crops are grown, but the karst topography limits their effectiveness. When rainfall is less than normal or is poorly distributed, these soils become somewhat droughty and crops can be damaged.

These soils are suited to grasses and legumes for hay or pasture. Deep rooted legumes are restricted by the depth to bedrock. Runoff, the hazard of erosion, and the depth to bedrock are the main concerns where these soils are reseeded to hay or pasture. Plowing on the contour or the use of minimum tillage when preparing the seedbed helps control erosion. Other major concerns of management are overgrazing and grazing when this unit is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

The soils in this unit are suited to trees. Equipment limitation, seedling mortality, and plant competition are concerns in management. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, the Caneyville soil is not suited to black walnut plantings.

These soils dominantly are severely limited for dwellings without basements because of slope. They are also severely limited for dwellings with basements because of slope and depth to bedrock. The selection of an alternate site may be necessary. Building designs should take into account the shallowness to rock. Grading the soil and designing structures to complement the slope can offset this limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion during construction. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. The gently sloping Hagerstown soils on the ridgetops are mostly suited to scattered, random building sites. This unit is severely limited for local roads and streets by low strength. Roads are generally constructed on the ridgetops. The upper layer of the soil should be replaced or strengthened with a more suitable base material. These soils are severely limited for septic tank absorption fields because of the depth to rock, slope, and restricted permeability. The ridgetop areas are most suited to absorption fields because it is easier to offset these limitations. Depth to rock and slope are extremely hard to overcome on the dominant part of the unit.

This complex is in capability subclass IVe. The woodland suitability subclass for the Caneyville soils is 3c and for the Hagerstown soils is 1c.

ChF—Chetwynd silt loam, 25 to 70 percent slopes. This steep and very steep, deep, well drained soil is on side slopes of glacial plains and terraces. Areas are generally narrow and long. They range from 10 to 100 acres and have a dominant size of about 25 acres.

In a typical profile the surface layer is brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The subsoil extends to a depth of 80 inches. It is yellowish brown, friable silt loam in the upper part; mottled strong brown and red, friable sandy clay loam in the middle part; and yellowish red and strong brown, friable sandy clay loam in the lower part. In some small areas the soil has formed in more than 18 inches of loess or in glacial till. In other small areas the subsoil contains less clay.

Included with this soil in mapping are a few small areas of well drained Hickory and Ryker soils. Hickory and Ryker soils formed in glacial till. Ryker soils are in the less sloping areas. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Chetwynd soil is high, and permeability is moderate. Surface runoff is very

rapid. Reaction of the surface layer is neutral to medium acid. The organic matter content of the surface layer is moderate.

Many areas of this soil are in woodland. A few areas are used for hay or pasture.

This soil is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Well established native grasses grow well in areas covered by a limited tree canopy. These areas are suitable for limited grazing. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition, the hazard of erosion, and equipment limitations are concerns in management. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for dwellings and is generally unsuited to this use because of slope. The selection of an alternate site may be necessary. Local roads are severely limited because of slope. Roads designed to complement the slope can offset this limitation. Cutting and filling may be necessary. The limitations for septic tank absorption fields are severe because of slope. Installing the absorption field on the steep and very steep slopes is very difficult.

This soil is in capability subclass VIIe and woodland suitability subclass 1r.

CoF—Corydon Variant-Caneyville Variant complex, 25 to 70 percent slopes. This complex consists of steep and very steep, shallow and moderately deep, well drained soils on sharp breaks that border the valleys. These soils are on side slopes of ridges along drainageways that deeply dissect the upland area. This unit is about 40 percent Corydon Variant soils and 35 percent Caneyville Variant soils. Areas are generally long and narrow. They range from 10 to 80 acres and have a dominant size of about 20 acres. The Corydon Variant soils are generally in the steeper areas. The Caneyville Variant soils are generally on the upper half of the landform or in areas of 25 to 35 percent slopes and on small benchlike slips. The Corydon Variant and Caneyville Variant soils in this complex are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Corydon Variant soil, the surface layer is very dark grayish brown flaggy silt loam about 1 inch thick. The subsurface layer is dark brown flaggy silt loam about 7 inches thick. The subsoil is about 8 inches thick. It is dark brown, friable flaggy silty clay loam in the upper part and dark brown, friable very flaggy silty clay loam in the lower part. Limestone bedrock is at a depth of 16 inches. In some small areas the soil contains less than 35 percent rock fragments, and it has a clay content that varies from 15 to 60 percent.

In a typical profile of the Caneyville Variant soil, the surface layer is dark brown channery silt loam about 3 inches thick. The subsoil is about 27 inches thick. It is yellowish brown, friable channery silt loam in the upper part, reddish brown, firm silty clay in the middle part, and reddish brown, firm flaggy clay in the lower part. Limestone bedrock is at a depth of 30 inches. In many small areas the soil has a deep, dark surface layer and the subsoil is more clayey.

Included with this complex in mapping are a few small areas of well drained Caneyville, Crider, and Hagerstown soils on the less sloping part of the unit and well drained Berks and Weikert soils on the more sloping part of the landform. Crider and Hagerstown soils are deeper to limestone bedrock than Corydon Variant and Caneyville Variant soils. The Berks and Weikert soils formed in sandstone, siltstone, or shale residuum. These sandstone areas only occur at the breaks where the exposed sandstone bedrock is in contact with the limestone bedrock. Also included are a few small areas of severely eroded soils on sharp slope breaks. Most delineations contain several rock outcrops. Inclusions make up about 20 to 30 percent of the unit.

The available water capacity of the Corydon Variant and Caneyville Variant soils is very low. Permeability is moderately slow in the Corydon Variant soil and slow in the Caneyville Variant soil. Surface runoff is very rapid on both soils. The organic matter content of the surface layer is moderate in both soils.

Many areas of these soils are in woodland. They are not suited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Well established native grasses grow well in areas covered by a limited tree canopy. These soils are suitable for limited grazing. Major concerns in management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition. When rainfall is less than normal or is poorly distributed, these soils become somewhat droughty and grasses are likely to be damaged.

The soils in this unit are suited to trees. Woodland is the best use of this unit, but it does not produce high quality woods. Erosion hazard, equipment limitation, seedling mortality, and plant competition are concerns in management. Windthrow hazard is also a concern in

management for Corydon Variant soils. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Depth to bedrock limits the number of planted trees that will survive. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, the Caneyville Variant soil is not suited to black walnut plantings.

These soils dominantly are severely limited for dwellings and are generally unsuited to this use because of steep and very steep slopes and depth to rock. The selection of an alternate site may be necessary. These soils dominantly are severely limited for local roads because of slope, depth to bedrock, and low strength. Designing roads to complement the slope can offset the slope limitation. Cutting and filling may be necessary, which may be limited by the depth to bedrock. The upper layer of the soil should be replaced or strengthened with a more suitable base material. This unit is severely limited for septic tank absorption fields and is generally not used for this purpose because of slope, depth to bedrock, and moderately slow permeability.

This complex is in capability subclass VIIe. The woodland suitability is 3d for the Corydon Variant soils and 3c for the Caneyville Variant soils.

CrB—Crider silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on narrow and broad convex ridgetops on uplands. Areas are generally elongated. They range from 3 to 400 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 80 inches or more. It is dark brown, friable silt loam in the upper part; strong brown and yellowish red, firm silty clay loam in the middle part; and yellowish red, firm silty clay in the lower part. In places, the loess mantle is more than 45 inches thick.

Included with this soil in mapping are small areas of Caneyville, Crider, and Hagerstown soils on the more sloping part. Also included are small flat or depressional areas of moderately well drained Bedford soils, well drained and moderately well drained Hosmer soils, and somewhat poorly drained Iva soils. The Caneyville and Hagerstown soils are shallower to limestone bedrock than the Crider soil. Bedford and Hosmer soils have a fragipan. Most delineations contain a few severely eroded soils and a few rock outcrops, sinkholes, and abandoned quarries. Inclusions make up about 10 to 15 percent of this unit.

The available water capacity of this Crider soil is high, and permeability is moderate. Runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the soil surface, terraces, diversions, contour farming, grassed waterways, or grade-stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is especially good for alfalfa. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is slightly limited for dwellings. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps to control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitation for septic tank absorption fields is moderate because permeability is moderate. Increasing the size of the filter field helps to compensate for the restricted permeability.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

CrC—Crider silt loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on narrow and broad convex ridgetops of the uplands. Areas are generally elongated. They range from 3 to 200 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 58

inches thick. It is brown and strong brown, friable silty clay loam in the upper part; yellowish red, friable silty clay loam in the middle part; and red, firm clay in the lower part. Hard limestone bedrock is at a depth of about 67 inches. In places, the loess mantle is more than 45 inches thick.

Included with this soil in mapping are small areas of Caneyville and Hagerstown soils. In the larger delineations small areas of Bedford, Crider, and Hosmer soils have slopes of less than 6 percent. Caneyville and Hagerstown soils are shallower to limestone bedrock than the Crider soil. Bedford and Hosmer soils have a fragipan. Small areas of Haymond, Wakeland, and Wilbur soils are in the bottom of some sinkholes, and small areas of severely eroded soils are on steep breaks. Some delineations contain a few rock outcrops and abandoned quarries. Inclusions make up 10 to 15 percent of the unit.

The available water capacity of this Crider soil is high, and permeability is moderate. Runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the soil surface, diversions, contour farming, grassed waterways, or grade-stabilization structures help control erosion and surface runoff. These slopes are generally too short for terracing. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is especially good for alfalfa. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and without basements because of slope. Grading the soil to modify the slope and designing structures to complement the slope can offset this limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets by low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Limitations are moderate for septic tank absorption fields because of slope and moderate permeability. Grading or land shaping to modify the slope and installing the absorption field on the contour can offset the slope limitation. Increasing the size of the filter field helps compensate for the restricted permeability.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

CrD—Crider silt loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on side slopes of the uplands. Areas are generally long and narrow. They range from 3 to 40 acres and have a dominant size of about 20 acres.

In a typical profile the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 1 inch thick. The subsoil is about 67 inches thick. It is yellowish brown, friable silt loam in the upper part; strong brown, friable silt loam in the next part; strong brown, friable silty clay loam in the next part; and yellowish red, friable cherty silty clay loam in the lower part. In places, the loess mantle is more than 45 inches thick.

Included with this soil in mapping are small areas of well drained Caneyville, Crider, and Hagerstown soils on the less sloping part of the unit and small areas of severely eroded Hagerstown soils. Also included are small areas of well drained Caneyville, Caneyville Variant, Corydon Variant, and Hagerstown soils in the steeper areas and small areas of somewhat poorly drained Wakeland and moderately well drained Wilbur soils in the bottom of some sinkholes. Caneyville, Caneyville Variant, Corydon Variant, and Hagerstown soils are shallower to limestone bedrock than the Crider soil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Crider soil is high, and permeability is moderate. Runoff from cultivated areas is rapid. The organic matter content of the surface layer is low.

Many areas of this soil are used for hay, pasture, or woodland. Some areas are used for cultivated crops.

This soil is generally unsuited to corn, soybeans, and small grain because of the slope and the very severe hazard of erosion. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the

crop residue on the surface, diversions, contour farming, grassed waterways, or grade-stabilization structures help control erosion and surface runoff. Slopes are generally too short for terracing. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture. It is especially good for alfalfa and other deep-rooted legumes. Rapid runoff and the hazard of erosion are the main concerns. Permanent vegetative cover slows runoff and helps control erosion. Plowing on the contour or conservation tillage helps control erosion when preparing the seedbed. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition, equipment limitations, and the hazard of erosion are management concerns. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites by slope. The selection of an alternate site may be necessary. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of soil should be replaced or strengthened with a more suitable base material. Roads and streets should be designed to complement the slope. Cutting and filling may be necessary. Septic tank absorption fields are severely limited because of slope. Grading or land shaping and installing the absorption field on the contour can offset this limitation.

This soil is in capability subclass IVe and woodland suitability subclass 1r.

CsC—Crider-Caneyville silt loams, 6 to 12 percent slopes. This complex consists of moderately sloping, deep and moderately deep, well drained soils on side slopes that deeply dissect the uplands. It is about 43 percent Crider soils and 42 percent Caneyville soils. Areas are generally long and narrow. They range from 3 to 100 acres and have a dominant size of about 20 acres. The topography is generally a uniform, moderately sloping landscape that has a few benchlike slips and a few sinkholes. The Crider soils are generally on the upper part of the side slopes, and the Caneyville soils are on the lower part. These soils are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Crider soil, the surface layer is dark brown silt loam about 3 inches thick in the upper part and brown silt loam about 9 inches thick in the lower part. The subsoil is about 48 inches thick. It is strong brown, friable silty clay loam in the upper part; strong brown, firm silty clay loam in the next part; yellowish red, firm silty clay loam in the next part; and dark brown, firm silty clay in the lower part. Many small areas have less clay in the subsoil. In places, the loess cap is between 45 and 60 inches thick.

In a typical profile of the Caneyville soil, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is about 33 inches thick. It is dark yellowish brown, friable silt loam in the upper part; strong brown, firm silty clay loam in the middle part; and reddish brown, firm silty clay in the lower part. Limestone bedrock is at a depth of 38 inches. Many small areas are more clayey in the subsoil.

Included with this complex in mapping are a few small areas of moderately well drained Bedford soils that are directly below the ridgetop, a few small areas of soils that are less than 20 inches to limestone bedrock, small severely eroded areas, and small areas of rock outcrop. Bedford soils have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity is high in the Crider soil and low in the Caneyville soil. Permeability is moderate in the Crider soil, and it is moderately slow in the Caneyville soil. Surface runoff from cultivated areas of both soils is medium. The organic matter content of the surface layer is low in the Crider soil and moderate in the Caneyville soil.

Many areas of this soil are used for hay or pasture. Some areas are used for cultivated crops, and a few areas are in woodland.

These soils are generally unsuited to corn, soybeans, and small grain. The hazard of erosion and depth to limestone bedrock are the main concerns in the use and management of these soils. The depth to limestone bedrock limits the effectiveness of most conservation practices. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, grassed waterways, or grade-stabilization structures reduce erosion and surface runoff. Slopes are generally too short for terracing. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. If rainfall is less than normal or is poorly distributed, these soils become somewhat droughty and crops are likely to be damaged.

These soils are suited to grasses and legumes for hay or pasture. Deep rooted legumes may be restricted by the depth to bedrock. Runoff, the hazard of erosion, and the depth to bedrock are the main concerns where these soils are reseeded to hay or pasture. Plowing on the contour and conservation tillage help to control erosion when preparing the seedbed. Major concerns of management are overgrazing and grazing when these soils are too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

The Crider soil is well suited to timber production, but the Caneyville soil is only suited to timber production. Plant competition is the main concern in management of the Crider soil. Equipment limitation and seedling mortality are concerns in management of the Caneyville soil. Because of the high clay content in the subsoil, harvesting and planting are limited to the drier seasons of the year. The depth to bedrock limits the number of properly planted trees that will survive. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. The Caneyville soil is generally not suited to black walnut plantings.

These soils are moderately limited for dwellings without basements because of slope and for dwellings with basements because of slope and depth to bedrock. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling of the soil. Grading the area and designing structures to complement the slope can affect this limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. The Caneyville soil has less potential for building sites than the Crider soil because of the moderate depth to rock and shrinking and swelling. The Crider and Caneyville soils are severely limited for local roads and streets because of low strength. The upper layer of these soils should be replaced or strengthened with a more suitable base material. Both soils in this unit are moderately limited for septic tank absorption fields because of slope and moderate and moderately slow permeability, but the Caneyville soil has lower potential for septic tank absorption fields because of moderate depth to rock. Increasing the size of the filter field helps to compensate for the moderate or moderately slow permeability of the soil. Grading or land shaping to modify the slope and installing the absorption field on the contour can offset the slope limitation.

This complex is in capability subclass IIIe. The woodland suitability subclass for the Crider soils is 1o and for the Caneyville soils is 3c.

CtB—Crider-Urban land complex, 2 to 6 percent slopes. This complex consists of gently sloping, deep, well drained Crider soil and areas of Urban land on narrow and broad convex ridgetops of the uplands. It is about 50 percent Crider soils and about 45 percent Urban land. Individual areas range from 10 to 200 acres and have a dominant size of about 40 acres. The Crider soils and Urban land are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Crider soil, the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 80 inches or more. It is dark brown, friable silt loam in the upper part; strong brown and yellowish red, firm silty clay loam in the middle part; and yellowish red, firm silty clay in the lower part. In places, the loess mantle is more than 45 inches thick.

In a typical area of Urban land, the soil has been so altered or obscured that classification is not practical. The main works and structures that cover the areas are streets, parking lots, shopping centers, houses, and buildings. Also, some of the low areas have been cut, built up, or smoothed.

Included with this complex in mapping and making up about 5 percent of the unit, are small areas of somewhat poorly drained Iva soils, which are in nearly level or depressional areas.

The Crider soil in this unit has high available water capacity, and permeability is moderate. Surface runoff is medium. The organic matter content of the surface layer is low, and reaction is generally medium acid or strongly acid in unlimed areas.

The Crider soil is used for parks, open space, building sites, lawns, and gardens. It has good potential for lawns, vegetable and flower gardens, trees, and shrubs. It has good potential for recreational areas and for most engineering uses. The downtown Bloomington area is as much as 95 percent Urban land. The outer edges of this unit are as little as 20 percent Urban land. Runoff collects in the sinkholes and may contaminate underground water supplies.

The Crider soil is well suited to grasses, flowers, vegetables, trees, and shrubs. Soil erosion generally is not a major problem of this unit unless the soils are disturbed and left bare and exposed for a long time or are used as a watercourse.

The Crider soil is slightly limited for dwellings. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion during construction. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. The Crider soil is severely limited for local roads and streets because of low strength. The

upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitation for septic tank absorption fields is moderate because permeability is moderate. Increasing the size of the filter field helps to compensate for this limitation. Onsite investigations are essential to properly evaluate and plan the development of specific sites.

The Crider soil is in capability subclass IIe and woodland suitability subclass 1o. Urban land is not assigned to interpretive groupings.

CtC—Crider-Urban land complex, 6 to 12 percent slopes. This complex consists of moderately sloping, deep, well drained Crider soil and areas of Urban land on narrow and broad convex ridgetops of the uplands. It is about 48 percent Crider soil and about 40 percent Urban land. Individual areas of this unit range from 10 to 100 acres and have a dominant size of about 40 acres. Crider soil and Urban land areas are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Crider soil, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 58 inches thick. It is brown and strong brown, friable silty clay loam in the upper part; yellowish red, friable silty clay loam in the middle part; and red, firm clay in the lower part. Hard limestone bedrock is at a depth of about 67 inches. In places, the loess mantle is more than 45 inches thick.

In a typical area of Urban land, the soil has been so altered or obscured that classification is not practical. The main works and structures that cover the areas are streets, parking lots, shopping centers, houses, and buildings. Also, some of the low areas have been filled or leveled during construction, and other small areas have been cut, built up, or smoothed.

Included with this complex in mapping are small areas of somewhat poorly drained Iva soils, which are in nearly level or depressional areas. Also included, in the broader delineations, are small flat areas of moderately well drained Bedford soils, well drained Crider soils, and well drained and moderately well drained Hosmer soils, all of which have slopes of less than 6 percent. The Bedford and Hosmer soils have a fragipan. Inclusions make up about 12 percent of the units.

The Crider soil in this unit has high available water capacity, and permeability is moderate. Runoff is medium. The organic matter content of the surface layer is low.

The Crider soil is used for parks, open space, building sites, lawns, and gardens. It has good potential for lawns, vegetable and flower gardens, trees, and shrubs. It has good potential for recreational areas and for most engineering uses. The downtown Bloomington area is as much as 95 percent Urban land. The outer edges of this unit are as little as 20 percent Urban land. Runoff collects in the sinkholes and may contaminate underground water supplies.

The Crider soil is well suited to grasses, flowers, vegetables, trees, and shrubs. Soil erosion generally is not a major problem of this unit unless the soils are disturbed and left bare and exposed for a long time or are used as a watercourse.

The Crider soil is moderately limited for dwellings because of slope. This can be offset by grading the area and designing structures to complement the slope. Exposed areas should be revegetated as soon as possible to help control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. The Crider soil is severely limited for local roads and streets because of low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are moderate because of slope and moderate permeability. Grading or land shaping and installing the absorption field on the contour can offset the slope limitation. Increasing the size of the filter field helps to compensate for the restricted permeability. Onsite investigations are essential to properly evaluate and plan the development of specific sites.

The Crider soil is in capability subclass IIIe and woodland suitability subclass 1o. Urban land is not assigned to interpretive groupings.

Cu—Cuba silt loam. This nearly level, deep, well drained soil is on broad flats and narrow stream channels on acid bottom land. It is subject to frequent flooding from January to May for brief periods. Areas are generally variable in size and shape. They range from 10 to 100 acres and have a dominant size of about 20 acres.

In a typical profile the upper part of the surface layer is dark brown silt loam about 9 inches thick and the lower part is yellowish brown silt loam about 4 inches thick. The subsoil is yellowish brown, friable silt loam about 15 inches thick. The substratum, to a depth of 45 inches, is mottled yellowish brown, pale brown, and brownish yellow silt loam. Below this to a depth of 60 inches the substratum is yellowish brown, mottled, stratified loam and silt loam. Some small areas of similar soils have less than 18 percent clay between depths of 10 and 40 inches and are medium acid to neutral throughout the profile. Also, in some small areas there are gray mottles within a depth of 20 inches.

Included with this soil in mapping are small areas of well drained Burnside and Haymond soils and small, slightly concave, lower lying areas of poorly drained Bonnie soils and somewhat poorly drained Stendal and Wakeland soils. Haymond soils have less clay and are less acid throughout than the Cuba soil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Cuba soil is very high, and permeability is moderate. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate. Many areas of this soil are

used for cultivated crops. Some of the areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. With proper management, this soil is suited to intensive row cropping. Flooding is the main concern. Small grain planted in fall is subject to severe damage during periods of prolonged flooding. Late planting of crops helps avoid damage or loss from flooding. Conservation tillage that leaves all or part of the crop residue on the soil surface and green manure crops improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for pasture or hay. This soil is poorly suited to deep rooted legumes, such as alfalfa, because of prolonged flooding. Major concerns in management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. From January to May frequent flooding may hinder harvesting and logging operations and also the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of frequent flooding. It would be better to select an alternate site. This soil is severely limited for local roads because of flooding and frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitation for septic tank absorption fields is also severe because of flooding. This soil is generally unsuited to this use.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

EbE—Ebal-Gilpin-Hagerstown silt loams, 18 to 25 percent slopes. This complex consists of steep, deep and moderately deep, moderately well and well drained soils on side slopes of the uplands. It is about 45 percent Ebal soils, 25 percent Gilpin soils, and 15 percent Hagerstown soils. Areas are generally long and narrow. They range from 10 to 100 acres and have a dominant size of about 25 acres. These soils are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Ebal soil, the surface layer is very dark grayish brown channery silt loam about 4 inches thick. The subsoil is about 40 inches thick. It is yellowish brown, firm channery silty clay loam in the upper part; yellowish brown, firm very channery silty clay loam in the middle part; and yellowish brown, mottled, firm clay in the lower part. The substratum, which extends to a depth of 54 inches, is gray, mottled shale. Hard sandstone bedrock is at a depth of 54 inches. In places the soil contains fewer coarse fragments throughout.

In a typical profile of the Gilpin soil, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsoil is yellowish brown, friable channery loam about 12 inches thick. The substratum, which extends to a depth of 24 inches, is yellowish brown very channery loam. Hard sandstone bedrock is at a depth of about 24 inches. In some places the subsoil and substratum are thicker.

In a typical profile of the Hagerstown soil, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsoil is about 34 inches thick. It is dark grayish brown, friable silty clay loam in the upper part and dark brown, firm silty clay in the lower part. The substratum, to a depth of 44 inches, is strong brown, mottled silty clay loam. Hard limestone bedrock is at a depth of about 44 inches. In places, the soil contains more than 35 percent coarse fragments in the subsoil.

Included with this complex in mapping on the more sloping part of the unit are small areas of well drained Berks, Caneyville, Caneyville Variant, and Corydon Variant soils. Berks soils do not have a horizon of clay accumulation and formed in residuum from sandstone, siltstone, and shale. Caneyville, Caneyville Variant, and Corydon Variant soils are shallower to limestone bedrock than Ebal, Gilpin, and Hagerstown soils. Most areas have many large rock fragments lying on the surface. A few rock outcrops, bedrock escarpments, and short steep slopes are in some areas. Inclusions make up about 5 to 15 percent of the unit.

The available water capacity is low in all three soils. Permeability in the Ebal soil is moderate in the upper part and very slow in the lower part, and it is moderate in both Gilpin and Hagerstown soils. Surface runoff is rapid in all of these soils. The organic matter content of the surface layer is low in the Ebal soil and moderate in the Gilpin and Hagerstown soils.

Many areas of these soils are in woodland. A few areas are used for grasses and legumes for hay or pasture.

These soils are generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Conservation practices are needed to help control erosion and surface runoff where crops are grown. The areas that are being cultivated are generally small and are surrounded by woodland. When rainfall is less than normal or is poorly distributed, this soil becomes somewhat droughty.

These soils are poorly suited to grasses and legumes for hay or pasture. Deep-rooted legumes are restricted by depth to bedrock or clayey shale. Rapid runoff and the hazard of erosion are the main concerns. Depth to bedrock in the Gilpin soil and clayey shale in the Ebal

soil are also limitations. A permanent cover of vegetation slows runoff and helps control erosion. Other major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This unit is well suited to trees. Erosion hazard, equipment limitations, and plant competition are concerns in management for all three soils. Seedling mortality and windthrow hazard are additional concerns for the Ebal soil. The depth to clayey shale or bedrock limits the number of planted trees that will survive. Machinery should be used with caution on these steep slopes. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, the Ebal and Gilpin soils are not suited to black walnut plantings.

This unit is severely limited for building sites because of steepness of slope and shrinking and swelling. The selection of an alternate site may be necessary. Limitations in areas used for dwellings can be offset if soils are graded and buildings are designed to complement the slope. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. Exposed areas should be revegetated as soon as possible to control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This unit is severely limited for local roads and streets because of slope, low strength, and shrinking and swelling. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing structures to complement the slope can help offset the slope limitation. Cutting and filling may be necessary but may be limited by depth to rock. Septic tank absorption fields mostly are severely limited because of slope and restricted permeability. These soils are generally unsuited to this use because of steepness of slope and depth to bedrock.

This complex is in capability subclass VIe. The woodland suitability subclass for the Ebal soils is 2c, for the Gilpin soils is 2r, and for the Hagerstown soils is 1c.

EdD—Ebal-Wellston-Gilpin silt loams, 12 to 18 percent slopes. This complex consists of strongly sloping, deep and moderately deep, moderately well drained and well drained soils on side slopes of the uplands. It is about 45 percent Ebal soils, 20 percent Wellston soils, and 15 percent Gilpin soils. Areas are generally long and narrow. They range from 10 to 100 acres and have a dominant size of about 25 acres. Wellston and Gilpin soils are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Ebal soil, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 58 inches thick. It is yellowish brown, friable silt loam in the upper part; yellowish brown, firm channery silty clay loam and channery silty clay in the next part; red, mottled, firm clay in the next part; and yellowish brown, mottled, firm clay in the lower part. The substratum to a depth of 80 inches or more is gray, mottled shale. In some small areas bedrock is within a depth of 40 to 60 inches.

In a typical profile of the Wellston soil, the surface layer is dark yellowish brown silt loam about 5 inches thick. The subsoil is about 45 inches thick. It is yellowish brown, friable silt loam in the upper part and light brownish gray, mottled, friable channery loam in the lower part. The substratum, which extends to a depth of 55 inches, is strong brown, mottled sandstone. Hard sandstone bedrock is at a depth of 55 inches. In places, bedrock is within 40 inches of the surface, the thickness of the surface layer and subsoil combined is more, or bedrock is below a depth of 72 inches. In some small areas the soil does not have as much clay in the subsoil.

In a typical profile of the Gilpin soil, the surface layer is yellowish brown loam about 6 inches thick. The subsoil is about 16 inches thick. It is yellowish brown, friable loam in the upper part and yellowish red, friable channery loam in the lower part. Hard sandstone bedrock is at a depth of 22 inches. In some places the sandstone bedrock is deeper or the subsoil has less clay.

Included with this complex in mapping are small areas of well drained Berks soils which make up about 5 percent of the unit. Also included on more sloping parts of the unit are small areas of well drained Caneyville, Caneyville Variant, and Corydon Variant soils. Berks soils do not have a horizon of clay accumulation, and they formed in residuum from sandstone, siltstone, and shale. Caneyville, Caneyville Variant, and Corydon Variant soils are shallow to limestone bedrock. Rock outcrops, bedrock escarpments, and short steep slopes are in a few places. Inclusions make up about 20 percent of the unit.

The available water capacity is moderate in the Ebal soil, high in the Wellston soil, and low in the Gilpin soil. Permeability is moderate in the upper part and very slow in the lower part of the Ebal soil and moderate in Gilpin and Wellston soils. Surface runoff is rapid in all three soils. The organic matter content of the surface layer is low in the Ebal soil and moderate in Gilpin and Wellston soils.

Many areas of this unit are in woodland. Some areas are used for hay or pasture.

The soils in this unit are generally unsuited to cultivated crops because of the very severe hazard of

erosion and steepness of slope. Cultivated areas are generally small and are surrounded by woodland, which limits the type of conservation practices that can be used. When rainfall is less than normal or is poorly distributed, this unit becomes somewhat droughty and crops are likely to be damaged.

These soils mostly are suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main concerns. The Gilpin soil is also limited by depth to bedrock. Deep-rooted legumes are restricted by the depth to bedrock and clayey shale. A permanent cover of vegetation slows runoff and helps control erosion. Plowing on the contour and conservation tillage help control erosion when preparing the seedbed. Other major concerns of management are overgrazing and grazing when these soils are too wet. Overgrazing reduces the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

These soils are well suited to trees. Erosion hazard, equipment limitation, and plant competition are the main concerns in management. Seedling mortality and windthrow hazard are additional concerns in the Ebal soil. Depth to bedrock in the Gilpin soil limits the number of planted trees that will survive. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, the Ebal and Gilpin soils are not suited to black walnut plantings.

These soils are severely limited for building sites. This unit dominantly is limited by slope and shrinking and swelling. The selection of an alternate site may be necessary. Soil areas used for dwellings should be graded and buildings should be designed to complement the slope in order to offset the slope limitation. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. Exposed areas should be revegetated as soon as possible to help control erosion during construction. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This unit is severely limited for local roads and streets because of slope. Low strength, shrinking and swelling, or potential frost action are additional limitations. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset the slope limitation. Cutting and filling may be necessary but may be limited by depth to rock. The limitations for septic tank absorption fields are severe, mostly because of slope, depth to rock, and reduced permeability. Grading or land shaping to modify the slope and installing the absorption field on the contour can help offset the slope limitation. Increasing the size of the filter field compensates for the restricted permeability.

This complex is in capability subclass IVe. The woodland suitability subclass for the Ebal soils is 2c and for the Wellston and Gilpin soils is 2r.

EkB—Elkinsville silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on broad terraces which are adjacent to drainageways and bottom land. It is subject to rare flooding. Areas are generally long and narrow. They range from 3 to 20 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is dark grayish brown and dark yellowish brown silt loam about 7 inches thick. The subsoil is about 53 inches thick. It is yellowish brown, friable silt loam and firm silty clay loam in the upper part; strong brown, firm silty clay loam and friable silt loam in the middle part; and yellowish brown, friable silt loam in the lower part. The substratum to a depth of 70 inches or more is yellowish brown silt loam.

Included with this soil in mapping are a few small flat or depressional areas of somewhat poorly drained Bartle and poorly drained Peoga soils. Also included are small areas of well drained Cuba and Haymond soils and moderately well drained Steff and Wilbur soils that are at a slightly lower elevation on the bottom land adjoining the Elkinsville soil. Some small areas of moderately well drained Pekin soils are on the higher lying positions. Bartle and Pekin soils have a fragipan. A few areas are severely eroded. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Elkinsville soil is very high, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also improve and help maintain tilth and organic matter content. Because this soil commonly is in small acreages, it is generally managed the same as the surrounding soil on the bottom land.

This soil is well suited to grasses and legumes for hay or pasture. This soil is suited to deep-rooted legumes, such as alfalfa. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods

as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of flooding. It is severely limited for local roads because of low strength and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitation for septic tank absorption fields is slight.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

EkF—Elkinsville silt loam, upland, 20 to 40 percent slopes. This moderately steep to very steep, deep, well drained soil is on terraces which are in steep areas adjacent to bottom land.

In a typical profile the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 55 inches thick. It is yellowish brown, friable silt loam in the upper part and strong brown, friable silt loam in the lower part. In places, the substratum has stratified layers of loam, silty clay loam, silt loam, clay, or sandy loam. In some areas the loess cap is more than 40 inches thick. In places glacial till is within a depth of 3 feet.

Included with this soil in mapping are areas 10 to 200 feet wide on the flatter part of ridgetops. They mostly consist of somewhat poorly drained Bartle soils, well drained and moderately well drained Hosmer soils, and well drained Elkinsville soils. Also included, on the more sloping part of the unit, are small areas that have silty clay or clay stratification in the subsoil and substratum and small areas of well drained Gilpin and Wellston soils. Bartle and Hosmer soils have a fragipan. Also, small severely eroded areas are on sharp slope breaks. Inclusions make up 15 to 20 percent of this unit.

The available water capacity of this Elkinsville soil is very high, and permeability is moderate. Surface runoff is very rapid. The organic matter content of the surface layer is low.

Many areas of this soil are in woodland. A few areas are used for grasses and legumes for hay or pasture.

This soil is generally unsuited to cultivated crops because of the severe hazard of erosion and steepness of slope.

This soil is unsuited to grasses and legumes for hay or pasture. Very rapid runoff, steepness of slope, and the hazard of erosion are the main concerns. A permanent cover of vegetation helps slow runoff and control erosion. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition, erosion hazard, and equipment limitations are concerns in management. The steep and very steep slopes limit the use of some harvesting equipment. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of steepness of slope. It would be better to select an alternate site. This soil is severely limited for local roads and streets because of potential frost action, low strength, and slope. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset the slope limitation. Cutting and filling may be necessary. Limitations for septic tank absorption fields are severe because of slope. Construction of the absorption field on these moderately steep to very steep slopes is very difficult, and this soil is not used for this purpose.

This soil is in capability subclass VIe and woodland suitability subclass 1r.

GpD—Gilpin silt loam, 12 to 18 percent slopes. This strongly sloping, moderately deep, well drained soil is on convex, dissected uplands. Areas are generally narrow and irregular in shape. They range from 5 to 50 acres and have a dominant size of about 20 acres.

In a typical profile the surface layer is yellowish brown and dark yellowish brown silt loam about 7 inches thick. The subsoil is about 21 inches thick. It is yellowish brown, friable silt loam in the upper part; strong brown, friable silt loam in the middle part; and strong brown, friable channery silt loam in the lower part. Interbedded sandstone bedrock is at a depth of 28 inches. In places, the subsoil and substratum are thicker. In some small areas the soil does not have as much clay in the subsoil.

Included with this soil in mapping are small areas of well drained Crider and Zanesville soils and moderately well drained Tilsit soils on the less sloping part of the unit. The Zanesville and Tilsit soils have a fragipan. Weikert soils are on the more sloping part of the unit. Also, a few severely eroded areas and a few sinkholes are in this unit. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Gilpin soil is moderate, and permeability is moderate. Surface runoff

is rapid. The organic matter content of the surface layer is low. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content. The rooting zone is less than 40 inches deep.

Many areas of this soil are in woodland. A few areas are used for hay or pasture.

This soil is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Conservation practices are needed to control erosion and surface runoff when crops are grown. Areas that are cultivated are generally small and are surrounded by woodland. This limits the types of conservation practices that can be used. When rainfall is less than normal or is poorly distributed, this unit becomes somewhat droughty and crops are likely to be damaged.

This soil is suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main concerns. Depth to bedrock is also a limitation, and it may restrict the use of deep-rooted legumes. A permanent cover of vegetation slows runoff and helps control erosion. Plowing on the contour and using conservation tillage when preparing the seedbed help control erosion. Other major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition, erosion hazard, and equipment limitations are concerns in management. Depth to bedrock limits the number of planted trees that will survive. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites because of slope. The selection of an alternate site may be necessary. Grading the area and designing structures to complement the slope can offset this limitation. Exposed areas should be revegetated as soon as possible to keep erosion from becoming a problem. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of slope. Designing structures to complement the slope can offset this limitation. Cutting and filling may be necessary but may be limited by depth to bedrock. The limitations for septic tank absorption fields are severe because of slope and depth to rock. Bedrock at a depth of 20 to 40 inches severely restricts the use of this soil for absorption fields.

This soil is in capability subclass IVe and woodland suitability subclass 2r.

GrD—Gilpin-Gullied land complex, 12 to 22 percent slopes. This complex consists of strongly sloping or moderately steep, moderately deep, well drained soils on side slopes of the highly dissected uplands. It is about 50 percent Gilpin soils and about 30 percent Gullied land. Areas are generally narrow and irregular in shape. They range from 3 to 50 acres and have a dominant size of about 5 acres. In many areas, the content of sandstone fragments is 5 to 40 percent and the plant cover is sparse. These areas are either many small gullies grouped together or one large area where erosion has occurred.

In a typical profile of Gilpin soil, the surface layer is dark brown and yellowish brown silt loam about 3 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, friable silt loam in the upper part; yellowish brown, firm silty clay loam in the middle part; and yellowish brown, firm channery silty clay loam in the lower part. Sandstone bedrock is at a depth of 39 inches.

In a typical area of Gullied land, 6 to 42 inches of the surface soil has been removed. These areas are generally elongated and range from 4 to 100 feet in width.

Included with this complex in mapping are a few small areas of well drained Wellston and Zanesville soils and moderately well drained Tilsit soils on the less sloping part of the unit and well drained Weikert soils on the more sloping part. Weikert soils do not have a horizon of clay accumulation. Tilsit and Zanesville soils have a fragipan, and Wellston soils are deeper to bedrock than the Gilpin soil. The surface layer in the severely eroded areas is generally channery or very channery silt loam that has sandstone fragments ranging from 1/4 inch to 5 inches in diameter. Inclusions make up about 15 to 20 percent of the unit.

The available water capacity of the Gilpin soil is low, and permeability is moderate. Surface runoff is very rapid. The surface layer can be tilled only throughout a narrow range in moisture content. The organic matter content of the surface layer is low. The rooting zone is less than 40 inches deep.

This unit is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Many areas have very little vegetation or ground cover. Where most of the original surface layer has been eroded, the soil is more clayey and has less organic matter. Tilth is poor, and preparing a desirable seedbed is difficult. Also, carryover of herbicides can occur, and this limits the use of this unit to certain crops in the following growing season. Poor germination is also a concern.

This unit is poorly suited to grasses and legumes for hay or pasture. Very rapid runoff and the very severe hazard of erosion are the main concerns. Depth to bedrock is also a limitation that may restrict the use of

deep-rooted legumes. A permanent cover of vegetation helps slow runoff and control erosion. If plowing is required, it must be done on the contour to help control soil erosion. Other major concerns of management are overgrazing and grazing when the unit is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This unit is well suited to trees. Plant competition is the main management concern. Depth to bedrock limits the number of planted trees that will survive. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this unit is not suited to black walnut plantings.

This unit is severely limited for building sites because of slope. The selection of an alternate site may be necessary. Grading the area and designing structures to complement the slope offset this limitation. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This unit is severely limited for local roads and streets because of slope. Designing roads and streets to complement the slope can offset this limitation. Cutting and filling may be necessary but may be limited by depth to bedrock. The limitations for septic tank absorption fields are severe because of slope and depth to rock. Bedrock at a depth of 20 to 40 inches severely limits the use of this soil for septic tank absorption fields.

The Gilpin soil is in capability subclass VIe and woodland suitability subclass 2r. Gullied land is not assigned to interpretive groupings.

HaC—Hagerstown silt loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on narrow and broad convex ridgetops of the uplands. Areas are generally elongated. They range from 3 to 200 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsoil is about 32 inches thick. It is strong brown and brown, friable silty clay loam in the upper part; strong brown, firm silty clay loam in the next part; red, firm silty clay in the next part; and dark brown and red, firm silty clay in the lower part. Hard limestone bedrock is at a depth of about 41 inches. In places, bedrock is within a depth of 40 inches. In a few small areas the soil formed in sandstone, shale, or siltstone residuum.

Included with this soil in mapping are small areas of well drained Crider, Gilpin, and Wellston soils on the more sloping part of the landform and small areas of well drained Haymond soils and moderately well drained Wilbur soils in the bottom of sinkholes. Bedford soils have a fragipan. Crider soils have a thicker loess cap than the Hagerstown soil. Gilpin and Wellston soils formed in sandstone, siltstone, and shale residuum. Some areas have a few rock outcrops, short steep slopes, severely eroded spots, and abandoned quarries. Inclusions make up 10 to 15 percent of the unit.

The available water capacity of this Hagerstown soil is moderate, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, grassed waterways, or grade stabilization structures control erosion and surface runoff. Slopes are generally too short for terracing. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. This soil will become droughty if the rainfall distribution pattern is not normal. Tillage of the soil when it is too wet results in large clods that become very firm when dry. Soil tilth is often improved by the freeze-thaw action of the soil during winter.

This soil is suited to grasses and legumes for hay or pasture. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Equipment limitations and plant competition are the main concerns in management. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Logging roads built on the contour will not cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil has a moderate limitation for dwellings with basements because of slope and shrinking and swelling. It has moderate limitations for dwellings without basements because of slope, depth to rock, and

shrinking and swelling. Footings, foundations, and basement walls need to be designed to withstand shrinking and swelling. Grading the area and designing structures to complement the slope can offset the limitation. Areas disturbed during construction should be revegetated as soon as possible to keep erosion losses at a minimum. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets by low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitation for septic tank absorption fields is moderate because of slope, depth to rock, and moderate permeability. Increasing the size of the filter field helps compensate for the restricted permeability. Grading, land shaping, and installing the absorption field on the contour can offset the slope limitation. Runoff collects in the sinkholes and may contaminate underground water supplies.

This soil is in capability subclass IIIe and woodland suitability subclass 1c.

HaD—Hagerstown silt loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on side slopes of the uplands. Areas are generally long and narrow. They range from 3 to 200 acres and have a dominant size of about 20 acres.

In a typical profile the surface layer is brown silt loam about 7 inches thick. The subsoil is about 51 inches thick. It is dark brown, friable silty clay loam in the upper part; yellowish red and red, firm silty clay or clay in the middle part; and reddish brown, firm clay in the lower part. Hard limestone bedrock is at a depth of about 58 inches. In places, the soil is less than 40 inches deep to bedrock. In a few small areas the soil formed in sandstone, shale, or siltstone residuum.

Included with this soil in mapping are small areas of well drained Crider, Gilpin, and Wellston soils. Also, small areas of well drained Caneyville Variant and Corydon Variant soils are included on the more sloping part of the unit. There are small areas of well drained Haymond soils, somewhat poorly drained Wakeland soils, and moderately well drained Wilbur soils in the bottom of sinkholes and in small severely eroded areas on nose slopes and sharp slope breaks. Caneyville Variant and Corydon Variant soils are shallower to limestone bedrock than the Hagerstown soil. Crider soils have a thicker loess cap. Gilpin and Wellston soils formed in sandstone, siltstone, or shale residuum. Some areas have a few rock outcrops, sinkholes, abandoned quarries, bedrock escarpments, and short steep slopes. Inclusions make up about 15 to 20 percent of the unit.

The available water capacity of the Hagerstown soil is moderate, and permeability is moderate. Surface runoff from cultivated areas is rapid. The organic matter content of the surface layer is low.

Many areas are in woodland. Some of the acreage is farmed and is used for cultivated crops and for hay or pasture.

This soil is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, and grassed waterways help control erosion and surface runoff. Slopes are generally too short for terracing. The sinkhole areas limit the effectiveness of most conservation practices that can be used. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. Tillage of the soil when it is too wet results in large clods that become firm when dry. Soil tilth is often improved by the freeze-thaw action of the soil during winter. This soil will become droughty if the rainfall distribution pattern is not normal.

This soil is suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main concerns. Permanent vegetative cover slows runoff and helps control erosion. Plowing on the contour or the use of minimum tillage when preparing the seedbed helps control erosion. Some major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Erosion hazard, equipment limitations, and plant competition are concerns in management. Unless logging roads are built on the contour, they will cause excessive erosion. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of slope. Grading the area and designing structures to complement the slope can offset this limitation. Areas disturbed during construction should be revegetated as soon as possible so that erosion losses will be kept at a minimum. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing structures to complement the slope can offset the slope limitation. Cutting and filling may be necessary but may be limited by the depth to bedrock. The limitation for septic tank absorption fields is severe because of slope. Grading, land shaping, and

installing the absorption field on the contour can help offset this limitation. Runoff collects in the sinkholes and may contaminate underground water supplies.

This soil is in capability subclass IVe and woodland suitability subclass 1c.

HaE—Hagerstown silt loam, 18 to 25 percent slopes. This moderately steep, deep, well drained soil is on side slopes of the uplands. Areas are generally long and narrow. They range from 5 to 40 acres and have a dominant size of about 15 acres.

In a typical profile the surface layer is very grayish brown silt loam about 2 inches thick in the upper part and dark brown silt loam about 6 inches thick in the lower part. The subsoil is about 40 inches thick. It is brown, friable silt loam in the upper part; brown, firm cherty silty clay in the middle part; and yellowish red and strong brown, firm very cherty clay in the lower part. Hard limestone is at a depth of about 48 inches. In places the soil is less than 40 inches to bedrock. In a few small areas the soil has less than 15 percent rock fragments throughout the subsoil or the soil formed in sandstone, shale, or siltstone residuum.

Included with this soil in mapping are small areas of well drained Crider, Gilpin, and Wellston soils on the less sloping part of the unit and well drained Caneyville Variant and Corydon Variant soils on the more sloping part. Caneyville Variant and Corydon Variant soils are shallower to limestone bedrock than the Hagerstown soil. Crider soils have a thicker loess cap, and Gilpin and Wellston soils formed in sandstone, siltstone, and shale residuum. There are also small areas of well drained Haymond soils, somewhat poorly drained Wakeland soils, and moderately well drained Wilbur soils in the bottom of sinkholes. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of the Hagerstown soil is moderate, and permeability is moderate. Surface runoff is rapid. The organic matter content of the surface layer is low.

Many areas of this soil are in woodland. A few areas are used for grasses and legumes for forage or pasture.

This soil is generally unsuited to cultivated crops because of a very severe hazard of erosion and steepness of slope. Conservation practices are needed to help control erosion where crops are grown. Cultivated areas are generally small and are surrounded by woodland. When rainfall is less than normal or is poorly distributed, this soil becomes somewhat droughty.

This soil is generally unsuited to grasses and legumes for hay or pasture. Rapid runoff, steepness of slope, and the hazard of erosion are the main limitations. Deep-rooted legumes are restricted by the depth to bedrock. A permanent cover of vegetation slows runoff and helps control erosion. Contour farming and conservation tillage help control erosion when preparing the seedbed. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Woodland is the best use of this unit, but it does not produce high quality woods. Erosion hazard, equipment limitations, and plant competition are concerns in management. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Unless logging roads are built on the contour, they will cause excessive erosion. Seedlings survive and grow well when competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired trees.

This soil is severely limited for building sites because of slope. The selection of an alternate site may be necessary. Grading the area and designing structures to complement the slope can offset this limitation. Areas disturbed during construction should be revegetated as soon as possible so that erosion losses can be kept at a minimum. Topsoil should be stockpiled and spread over areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset the slope limitation. Cutting and filling may be necessary but may be limited by depth to bedrock. The moderately steep slope is a severe limitation for septic tank absorption fields and makes them difficult to install. Grading, land shaping to modify the slope, and installing the absorption field on the contour may offset the limitation.

This soil is in capability subclass VIe and woodland suitability subclass 1c.

HbD3—Hagerstown silty clay loam, 12 to 22 percent slopes, severely eroded. This strongly sloping or moderately steep, deep, well drained soil is on side slopes of the highly dissected uplands. Areas are generally narrow and irregular in shape. They range from 3 to 100 areas and have a dominant size of about 8 acres.

In a typical profile the surface layer is brown silty clay loam about 6 inches thick. The subsoil is about 48 inches thick. It is yellowish red, friable silty clay loam in the upper part; yellowish red, firm silty clay in the next part; red, firm clay in the next part; and reddish brown and yellowish red, firm cherty clay in the lower part. Limestone bedrock is at a depth of about 54 inches. The surface layer is 5 to 30 percent limestone fragments. Many small gullies are in some areas and 6 to 40 inches of the soil has been removed. These gullied areas are

generally elongated and range from 4 to 200 feet in width. In places limestone bedrock is within a depth of 40 inches. In some areas there are more coarse fragments on the surface.

Included with this soil in mapping are small knolls of less sloping, moderately well drained Bedford soils and well drained Crider soils. Also included in steeper areas are Caneyville Variant and Corydon Variant soils. Bedford soils have a fragipan, and Crider soils have a thicker loess cap than the Hagerstown soil. Caneyville Variant and Corydon Variant soils are shallower to limestone bedrock. Most delineations contain many rock outcrops, and some have a few short steep slopes and bedrock escarpments. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity and the permeability of the Hagerstown soil are moderate. Surface runoff is very rapid. Reaction of the surface layer is strongly acid or very strongly acid, unless the soil is limed. The organic matter content of the surface layer is low.

Many areas of this soil are abandoned. It has very little vegetation or ground cover.

This soil is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Where most of the original surface layer has been eroded, the soil is more clayey and has less organic matter. Tilth is poor, and a desirable seedbed is difficult to develop. Also, a carryover of herbicides can occur, and this limits the use of this soil to certain crops in the following growing season. Poor germination is also a concern.

This soil is poorly suited to grasses and legumes for hay or pasture. Very rapid runoff and the very severe hazard of erosion are the main concerns. Depth to bedrock is also a limitation, and it may restrict the use of deep-rooted legumes. A permanent cover of vegetation slows runoff and helps control erosion. Conservation tillage and contour farming help control erosion and surface runoff when seedbeds are prepared for grasses and legumes. Other major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Woodland is the best use of this unit, but it does not produce high quality woods. Erosion hazard, equipment limitations, and plant competition are concerns in management. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Unless logging roads are built on the contour, they cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of slope. The selection of an alternate site may be necessary. Grading the area and designing structures to complement the slope can offset the slope limitation. Disturbed areas should be revegetated as soon as possible after construction. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset the slope limitation. Cutting and filling may be necessary but may be limited by the depth to bedrock. The limitation for septic tank absorption fields is severe because of slope. Grading, land shaping to modify the slope, and installing the absorption field on the contour can offset this limitation. Bedrock may also interfere with the functioning of the absorption field.

This soil is in capability subclass VIe and woodland suitability subclass 1c.

Hc—Hagerstown-Caneyville silt loams, karst. This complex consists of moderately sloping to steep, deep and moderately deep, well drained soils on convex ridgetops and side slopes of the uplands. It is about 66 percent Hagerstown soils and 26 percent Caneyville soils. Also, it is a karst, or sinkhole, region. Areas are variable in size and shape. They range from 5 to 200 acres and have a dominant size of about 20 acres. This unit has many sinkholes that serve as the drainage system; there are no drainageways. After a limited amount of water collects in the sinkholes, it drains very rapidly. The sinkholes are separated by narrow ridgetops. The Caneyville and Hagerstown soils are so intermingled that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Hagerstown soil, the surface layer is dark brown silt loam about 4 inches thick. The subsoil is about 38 inches thick. It is brown, friable silt loam in the upper part; strong brown, friable cherty silt loam in the middle part; and yellowish red, firm very cherty clay in the lower part. Limestone bedrock is at a depth of about 42 inches. In some places, the soil has more silt and less sand in the subsoil. In other places, the soil has less clay and more sand in the subsoil.

In a typical profile of the Caneyville soil, the surface layer is brown silt loam about 3 inches thick. The subsoil is about 37 inches thick. It is yellowish brown, friable silt loam in the upper part; yellowish brown, firm silty clay loam in the next part; strong brown, firm silty clay loam in the next part; and red, very firm clay in the lower part. Limestone bedrock is at a depth of about 40 inches. In places, the subsoil is less clayey.

Included with this complex in mapping on sharp slope breaks are a few small areas of soils that have limestone

bedrock within 20 inches of the surface and small areas that are severely eroded. In small areas well drained Haymond soils and somewhat poorly drained and moderately well drained Wilbur soils are in the bottom of sinkholes. Also included are small areas of well drained Hickory soils that have many sinkholes. Also included are some areas of moderately well drained Bedford soils that are on the wider, gently sloping ridgetops. Bedford soils have a fragipan. Some delineations contain a few rock outcrops and abandoned quarries. Inclusions make up 6 to 10 percent of the unit.

The available water capacity of Hagerstown and Caneyville soils is low. Permeability is moderate in the Hagerstown soil and moderately slow in the Caneyville soil. Surface runoff is rapid on both soils. The organic matter content of the surface layer is low in the Hagerstown soil and moderate in the Caneyville soil.

Many areas of these soils are in woodland. Some areas are used for hay or pasture.

These soils are generally unsuited to corn, soybeans, and small grain because of sinkholes, steepness of slope, and the very severe hazard of erosion. Depth to limestone bedrock also is a severe limitation.

These soils are poorly suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main concerns. Deep-rooted legumes may be restricted by the depth to bedrock. Other major concerns of management are overgrazing and grazing when these soils are too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

The Hagerstown soil is well suited to timber production, and the Caneyville soil is only suited to woodland. Woodland is the best use of this unit, but it does not produce high quality woods. Erosion hazard, equipment limitations, and plant competition are concerns in management for both soils. Seedling mortality is also a concern for the Caneyville soil. Slope may limit the use of logging or harvesting machinery. Erosion may become a concern in harvested areas. Because of the high content of clay in the subsoil, harvesting and planting are limited to the drier seasons of the year. Unless logging roads are built on the contour, they cause excessive erosion. Seedlings survive and grow well when competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this unit is not suited to black walnut plantings.

These soils are severely limited for building sites. They are limited by slope for dwellings without basements, and they are limited by slope and depth to bedrock for dwellings with basements. The selection of an alternate site may be necessary. Grading the area and designing structures to complement the slope can offset this limitation. Building designs should take into account the depth to bedrock. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. The gently sloping soils on the ridgetop are the best suited to scattered, random building sites. These soils are severely limited for local roads and streets because of low strength and slope. Roads are generally constructed on the ridgetops. The upper layer of soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset the slope limitation. Cutting and filling may be necessary but may be limited by depth to rock.

These soils dominantly are severely limited for septic tank absorption fields because of slope, depth to rock, and restricted permeability. The limitations are easier to offset on ridgetops. Depth to rock and slope are extremely hard to overcome on the dominant part of the unit. Runoff collects in the sinkholes and may contaminate underground water supplies.

This complex is in capability subclass VIe. The woodland suitability subclass is 1c for the Hagerstown soils and 3c for the Caneyville soils.

Hd—Haymond silt loam. This nearly level, deep, well drained soil is on bottom land. Small areas of this soil are in the bottom of sinkholes. This soil is subject to frequent flooding from January to May for brief periods. Areas are generally variable in size and shape. They range from 3 to 200 acres and have a dominant size of about 25 acres.

In a typical profile the surface layer is dark brown and dark grayish brown silt loam about 10 inches thick. The substratum to a depth of 60 inches or more is dark brown and yellowish brown silt loam. In places, the soil is more than 18 percent clay and is strongly acid or very strongly acid throughout the profile. In a few areas low-chroma mottles are within 20 inches of the surface.

Included with this soil in mapping are small areas of well drained Burnside soils that are on the upper end of drainageways. These soils have more than 35 percent coarse fragments throughout. Also included are small, slightly concave, lower lying areas of poorly drained Bonnie soils and somewhat poorly drained Stendal and Wakeland soils.

The available water capacity of this Haymond soil is very high, and permeability is moderate. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate.

Many areas of this soil are used for cultivated crops. Some of the areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. With proper management, it is suited to intensive

row cropping. Flooding is the main concern. Small grain planted in fall is subject to severe damage during periods of prolonged flooding. Late planting of crops helps avoid damage or loss from flooding. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and crop residue management improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for pasture or hay. This soil is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Flooding may hinder harvesting and logging operations and also the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of frequent flooding. It would be better to select an alternate site. This soil is severely limited for local roads because it is subject to frequent flooding and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are also severe because this soil is subject to frequent flooding.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

HkF—Hickory silt loam, 25 to 70 percent slopes. This steep and very steep, deep, well drained soil is on loess-covered side slopes of glacial plains. Areas are generally narrow and long. They range from 10 to 100 acres and have a dominant size of about 25 acres.

In a typical profile the surface layer is dark grayish brown and very dark brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 37 inches thick. It is yellowish brown, friable loam and clay loam in the upper part and strong brown, firm clay loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam. In places, the subsoil has less clay or more sand in the lower part.

Included with this soil in mapping are well drained Corydon Variant and Ryker soils on the steeper part of the unit and the well drained Alford, Chetwynd, and Ryker soils on the less sloping part of the landform. Alford and Ryker soils have a thicker loess cap than the Hickory soil. Chetwynd soils formed in glacial outwash, and Corydon Variant soils formed in limestone residuum. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Hickory soil is high, and permeability is moderate. Surface runoff is very rapid. Reaction of the surface layer ranges from neutral to medium acid. The organic matter content of the surface layer is low.

Many areas of this soil are in woodland. A few areas are used for grasses and legumes for hay or pasture.

This soil is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Well established native grasses grow well in areas covered by a limited tree canopy. These areas are suitable for limited grazing. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Erosion hazard, equipment limitations, and plant competition are concerns in management. Unless logging roads are built on the contour, they cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for dwellings and is generally unsuited for this use because of slope. The selection of an alternate site may be necessary. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over critical areas where vegetation is difficult to establish. Local roads are severely limited because of slope. Roads and streets designed to complement the slope can offset this limitation. Cutting and filling may be necessary. The limitations for septic tank absorption fields are severe because of slope. Installation of the absorption field is very difficult on the steep and very steep slopes.

This soil is in capability subclass VIIe and woodland suitability subclass 1r.

HoA—Hosmer silt loam, 0 to 2 percent slopes. This nearly level, well drained and moderately well drained soil is moderately deep to a fragipan. It is on broad convex ridgetops of the loess-covered uplands. Areas are generally broad and irregular in shape. They range from 4 to 50 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is brown silt loam

about 8 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The subsoil is about 42 inches thick. It is yellowish brown, friable silt loam in the upper part; has a fragipan of yellowish brown, mottled, very firm and brittle silty clay loam in the middle part; and is yellowish brown, firm silt loam in the lower part. The substratum to a depth of 72 inches or more is gray and yellowish brown silt loam and silty clay loam. In places, the soil has a loess cap less than 50 inches thick or has stratification in the lower part of the subsoil.

Included with this soil in mapping are small areas of Alford, Bedford, Crider, Tilsit, and Zanesville soils. Also included are small depressional areas of Iva soils. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of the Hosmer soil is moderate. Permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is low. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content. This soil has a seasonal high water table at a depth of 3 to 6 feet during March and April. Because the fragipan is at a depth of 23 to 36 inches; the water table is perched and root penetration is restricted.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The available water capacity is the main concern in use and management. The depth to the very slowly permeable fragipan determines the available water capacity for this soil by restricting the downward movement of roots. The soil is wet and seepy in spring but is droughty in late summer. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. The fragipan limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is slightly limited for dwellings without basements. It is moderately limited for dwellings with basements because of wetness. Foundation drains, landscaping to remove runoff, and drainage ditches lower the water table and remove excess water. This soil is severely limited for local roads and streets because of potential frost action and low strength. Drainage ditches lower the water table and help prevent damage from frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material.

The limitations for septic tank absorption fields are severe because of wetness and a very slowly permeable fragipan. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field. The use of the soil as a filter field then depends on the permeability of the material below the fragipan.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

HoB—Hosmer silt loam, 2 to 6 percent slopes. This gently sloping, well drained and moderately well drained soil is moderately deep to a fragipan. It is on narrow and broad ridgetops of the loess-covered uplands. Areas are generally broad and irregular in shape. They range from 10 to 250 acres and have a dominant size of about 75 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 52 inches thick. It is yellowish brown, friable silt loam in the upper part and has a fragipan of strong brown, brown, and yellowish brown, very firm and brittle silt loam in the lower part. The substratum to a depth of 72 inches or more is reddish yellow silt loam. In places, this soil has a loess cap less than 50 inches thick or has stratification in the lower part of the subsoil.

Included with this soil in mapping are small areas of well drained Alford, Crider, and Wellston soils and small depressional areas of somewhat poorly drained Iva soils. These soils do not have a fragipan and make up about 10 to 15 percent of the unit.

The available water capacity of this Hosmer soil is moderate. Permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low. This soil has a seasonal high water table at a depth of 3 to 6 feet during March and April. Because the fragipan is at a depth of 23 to 36 inches, root penetration is restricted and the water table is perched.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. The very slowly permeable fragipan affects the use and management. The soil is wet and seepy in spring but can be droughty late in summer. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. The fragipan limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is slightly limited for dwellings without basements. It is moderately limited for dwellings with basements because of wetness. Foundation drains, landscaping to remove runoff, and drainage ditches lower the water table and remove excess water. Areas disturbed during construction should be revegetated as soon as possible to keep erosion from becoming a concern. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of potential frost action and low strength. Drainage ditches lower the water table and help prevent damage from frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material.

The limitations for septic tank absorption fields are severe because of wetness and a very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

HoC—Hosmer silt loam, 6 to 12 percent slopes. This moderately sloping, well drained and moderately well drained soil is moderately deep to a fragipan. It is on ridgetops and side slopes of the loess-covered uplands. Areas are generally long and narrow. They range from 10 to 100 acres and have a dominant size of about 15 acres.

In a typical profile the surface layer is dark grayish brown and brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is dark yellowish brown, friable silty clay loam in the upper part; has a fragipan of mottled yellowish brown, brown, and strong brown, very firm and brittle silt loam in the middle part; and is strong brown, mottled, friable silty clay loam in the lower part. The substratum to a depth of 60 inches or more is brown, mottled silty clay loam. In places, this soil has a loess cap less than 50 inches thick or has stratification in the lower part of the subsoil.

Included with this soil in mapping on the steeper part of the unit are small areas of well drained Caneyville, Crider, and Hagerstown soils; small depressional areas of somewhat poorly drained Iva soils; and small flat areas of well drained Alford soils that have slopes of less than 6 percent. These soils do not have a fragipan and make up about 10 to 15 percent of the unit.

The available water capacity of this Hosmer soil is moderate. Permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low. This soil has a seasonal high water table at a depth of 3 to 6 feet during March and April. Because the fragipan is at a depth of 23 to 36 inches, root penetration is restricted and the water table is perched.

Many areas of this soil are used for hay or pasture. Some areas are used for cultivated crops, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. The very slowly permeable fragipan affects the use and management. This soil is wet and seepy in spring but can be droughty late in summer. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. This soil is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet.

Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. The fragipan layer limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is moderately limited for buildings without basements because of slope. It is moderately limited for buildings with basements because of wetness and slope. Foundation drains, landscaping to remove runoff, and drainage ditches are needed to lower the water table and help remove excess water. Grading the area and designing structures to complement the slope can offset the slope limitation. Exposed areas should be revegetated as soon as possible after construction to hold erosion losses to a minimum. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of potential frost action and low strength. Drainage ditches lower the water table and help prevent damage from frost action.

The limitations for septic tank absorption fields are severe because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

HtB—Hosmer-Urban land complex, 2 to 12 percent slopes. This complex consists of gently sloping, well drained and moderately well drained Hosmer soils which are moderately deep to a fragipan and areas of Urban land. It is about 40 percent Hosmer soils and about 30 percent Urban land. It is on narrow and broad convex ridgetops of the loess-covered uplands. Individual areas of this unit range from 5 to 200 acres and have a dominant size of about 40 acres. The Hosmer soils and Urban land areas are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Hosmer soil, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 52 inches thick. It is yellowish brown, friable silt loam in the upper part; is yellowish brown, firm silt loam in the middle part; and has a fragipan of strong brown, brown, and yellowish brown, very firm and brittle silt loam in the lower part. The substratum to a depth of 72 inches or more is reddish yellow, mottled silt loam. In places the loess cap is less than 50 inches thick.

In a typical area of Urban land, the soil profile has been so altered or obscured that classification is not practical. The main works and structures that cover the areas are streets, parking lots, shopping centers, houses, and buildings. Also, some of the low areas have been filled or leveled during construction, and other small areas have been cut, built up, or smoothed.

Included in mapping the broader areas of this complex are a few depressional areas of somewhat poorly drained Iva soils. Inclusions make up about 25 to 35 percent of the unit.

The Hosmer soil has moderate available water capacity. Permeability is moderate above the fragipan and very slow within the fragipan. The surface runoff is medium. Reaction of the surface layer ranges from very strongly acid to medium acid. The organic matter content of the surface layer is low. The Hosmer soil has a seasonal high water table at a depth of 3 to 6 feet during March and April. Because the fragipan is at a depth of 23 to 36 inches, root penetration is restricted and the water table is perched.

Most areas of this unit have perimeter drains that feed into storm sewers. When the soils in this unit are not drained, the seasonal high water table becomes a limitation. The Hosmer soil is used for parks, open space, building sites, lawns, and gardens, and it is suitable for this use. Where the surface soil has been removed down to the fragipan, it is difficult to establish vegetation.

The Hosmer soil is suited to grasses, flowers, vegetables, trees, and shrubs. Soil erosion generally is not a major concern unless the soil is disturbed and left exposed for a considerable period or is used as a watercourse.

The Hosmer soil is slightly limited for dwellings without basements and moderately limited for dwellings with basements because of wetness. Foundation drains, landscaping to remove runoff, and drainage ditches lower the water table and remove excess water. Exposed areas should be revegetated as soon as possible after construction to hold soil erosion to a minimum. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. The Hosmer soil is severely limited for local roads and streets because of potential frost action and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Drainage ditches lower the water table and help prevent damage from frost action.

The Hosmer soil is severely limited for septic tank absorption fields because of wetness and the very slowly permeable fragipan. Sanitary facilities should be connected to commercial sewers and treatment facilities

where available. Onsite investigations are essential to properly evaluate and plan the development of specific sites.

The Hosmer soil is in capability subclass IIe and woodland suitability subclass 2o. Urban land is not assigned to interpretive groupings.

IvA—Iva silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is on broad, convex ridgetops of the loess-covered uplands. Areas are generally broad and irregular in shape. They range from 3 to 30 acres and have a dominant size of about 15 acres.

In a typical profile the upper part of the surface layer is dark grayish brown, mottled silt loam about 2 inches thick, and the lower part is grayish brown, mottled silt loam about 4 inches thick. The subsurface layer is light brownish gray, mottled, friable silt loam about 6 inches thick. The subsoil is light brownish gray, yellowish brown, and gray, mottled, firm silty clay loam about 35 inches thick. The substratum to a depth of 60 inches or more is light grayish brown, mottled silt loam. In places, the subsoil extends to a depth of more than 60 inches. Some areas are dominantly gray throughout the subsoil.

Included with this soil in mapping are small areas of well drained Crider soils, well drained and moderately well drained Hosmer soils, moderately well drained Bedford and Tilsit soils, and somewhat poorly drained Bartle soils. Bedford, Bartle, Hosmer, and Tilsit soils have a fragipan. Crider soils have a thinner loess cap than the Iva soil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Iva soil is high, and permeability is slow. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 1 to 3 feet from January to April.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. It is generally not adequately drained. Wetness is the main concern in the use and management of this soil. Excess water can be removed by open ditches and surface drains. This soil is suited to intensive row cropping if drained and properly managed. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops improve and help maintain tilth and organic matter content. Frost and water damage can be reduced by using short season varieties of adapted crops.

This soil is suited to grasses and water-tolerant legumes for hay or pasture. It is too wet to be used for most legumes. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites because of wetness. It would be better to select an alternate site, but if this soil is used for dwellings it should be artificially drained. Dwellings should be constructed without basements. Foundation drains, landscaping to remove runoff, and drainage ditches lower the water table and remove the excess water. This soil is severely limited for local roads and streets because of potential frost action and low strength. Drainage ditches are needed along roads to lower the water table and help prevent damage from frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material.

The limitation for septic tank absorption fields is also severe because of wetness and slow permeability. When commercial sewers and treatment facilities are not available, perimeter drains around the filter field have been used to lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

MbB—Martinsville loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on terraces. This soil is adjacent to large streams. Areas are elongated. They range from 3 to 50 acres and have a dominant size of about 15 acres.

In a typical profile the surface layer is dark brown loam about 12 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil is about 51 inches thick. It is dark yellowish brown and yellowish brown, friable loam in the upper part; dark brown, mottled, friable clay loam in the next part; yellowish red, friable loam in the next part; and yellowish brown, friable clay loam in the lower part. The substratum to a depth of 70 inches or more is mottled dark brown and strong brown loamy sand. In places, the subsoil extends to a depth of less than 36 inches.

Included with this soil in mapping are a few small depressional areas of the somewhat poorly drained Whitaker and Zipp Variant soils. Also included are small areas of moderately well drained Pekin soils that have slopes of less than 2 percent and small areas of well drained Princeton soils that are on the more sloping part of the landform. Pekin soils have a fragipan, and

Princeton soils do not have stratification in their subsoil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this soil is high, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is moderate.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. Crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. Since this soil commonly occurs in small acreages, it is generally managed the same as the surrounding soils.

This soil is well suited to grasses and legumes for hay or pasture. It is suited to deep rooted legumes, such as alfalfa. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and without basements because of the shrinking and swelling. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is moderately limited for local roads and streets because of low strength and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations are slight for septic tank absorption fields.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

PaB—Parke silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on glacial outwash plains and terraces. Areas are broad and irregular in shape. They range from 5 to 40 acres and have a dominant size of about 15 acres.

In a typical profile the surface layer is brown silt loam about 10 inches thick. The subsoil extends to a depth of 80 inches. It is yellowish brown, friable silty clay loam in the upper part; yellowish red, firm clay loam in the next part; red, friable loam in the next part; and red, firm clay loam in the lower part. In places, the loess cap is more than 40 inches thick. In a few small areas the loess cap is less than 20 inches thick or glacial till is within a depth of 3 feet.

Included with this soil in mapping are small areas of somewhat poorly drained Bartle soils and moderately well drained Pekin soils. Bartle and Pekin soils have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Parke soil is high, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for hay or pasture, and some are used for cultivated crops. A few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is especially good for alfalfa. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to timber production. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and without basements because of the shrinking and swelling. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is

difficult to establish. This soil is severely limited for local roads and streets because of potential frost action and low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are slight.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

PaC—Parke silt loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on glacial outwash plains and terraces. Areas are long and narrow. They range from 5 to 75 acres and have a dominant size of about 15 acres.

In a typical profile the upper part of the surface layer is brown silt loam about 7 inches thick, and the lower part is dark yellowish brown silt loam about 2 inches thick. The subsoil extends to a depth of 80 inches. It is brown, friable silty clay loam in the upper part; mottled yellowish red and reddish brown, friable sandy clay loam and firm gravelly clay loam in the next part; mottled red and yellowish red, firm sandy clay loam in the next part; and mottled red and yellowish red, firm gravelly clay loam in the lower part. In places, the loess mantle is more than 40 inches thick. In a few small areas this soil has less than 20 inches of loess or glacial till within a depth of 3 feet.

Included with this soil in mapping are small areas of somewhat poorly drained Bartle soils and moderately well drained Pekin soils. Bartle and Pekin soils have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Parke soil is high, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for hay or pasture, and some areas are in woodland. A few areas are used for cultivated crops.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, and grassed waterways help control erosion and surface runoff. Slopes are generally too short for terracing. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is especially good for alfalfa and other deep-rooted legumes. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and without basements because of slope and shrinking and swelling. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. Grading the area and designing structures to complement the slope can offset the slope limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of potential frost action and low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitation for septic tank absorption fields is moderate because of the slope. Grading, or land shaping to modify the slope, and installing the absorption field on the contour can offset this limitation.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

PcD—Parke-Chetwynd silt loams, 12 to 18 percent slopes. This complex consists of strongly sloping, deep, well drained soils on short, steep slopes surrounding glacial plains and terraces. It is about 45 percent Parke soils and 30 percent Chetwynd soils. Areas are long and narrow. They range from 5 to 200 acres and have a dominant size of about 20 acres. The Chetwynd soils are generally in the more sloping, lower lying areas of the landform. The Parke soils are generally on the upper part of the landform. The Chetwynd and Parke soils are so intermingled that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Parke soil, the surface layer is dark brown silt loam about 1 inch thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil extends to a depth of 80 inches. It is yellowish brown, friable silt loam in the upper part; strong brown, friable silty clay loam and sandy clay loam in the middle part; and yellowish red, friable sandy clay loam and firm clay loam in the lower part. In places, the loess cap is more than 40 inches thick. In a few small areas the soil has less than 20 inches of loess or glacial till is within a depth of 3 feet.

In a typical profile of the Chetwynd soil, the upper part of the surface layer is dark brown silt loam about 2 inches thick, and the lower part is yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of 80 inches. It is yellowish red, friable clay loam

in the upper part; strong brown and yellowish red, friable sandy clay loam in the next part; yellowish red and reddish brown, friable sandy clay loam in the next part; and yellowish red and strong brown, friable sandy clay loam in the lower part. In places, this soil has more than 18 inches of loess or it formed in glacial till.

Included with this complex in mapping are small areas of well drained Elkinsville soils, upland phase, and Hickory soils. Included in less sloping areas are somewhat poorly drained Bartle soils and moderately well drained Pekin soils. Elkinsville soils, upland phase, are not so red and Hickory soils have a thinner loess cap than Parke and Chetwynd soils. Bartle and Pekin soils have a fragipan. Severely eroded soils and small areas of rock outcrop are also included. Inclusions make up about 20 to 25 percent of the unit.

The available water capacity is high, and permeability is moderate for both Parke and Chetwynd soils. Surface runoff is rapid on both soils. The organic matter content of the surface layer is low in both soils.

Many areas of these soils are in woodland. Some areas are used for hay or pasture, and a few areas are used for cultivated crops.

These soils are generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. Cultivated crops are generally not grown on this unit, but if they are grown, conservation practices are needed to control erosion and surface runoff. The cultivated areas are generally small and are surrounded by woodland, which limits the type of conservation practices that can be used.

This unit is suited to grasses and legumes for hay or pasture. It is especially good for alfalfa and other deep-rooted legumes. Rapid runoff and the hazard of erosion are the main concerns. Well established native grasses grow well in areas covered by a limited tree canopy. A permanent vegetative cover slows runoff and helps control erosion. Plowing on the contour or conservation tillage helps control erosion when preparing the seedbed. Other major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

These soils are well suited to trees. Plant competition is the main management concern. Unless logging roads are built on the contour, they cause excessive erosion. Slopes may be too steep for some machinery. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

These soils are severely limited for building sites because of slope. The selection of an alternate site may be necessary. Grading the soil and designing structures to complement the slope can offset the limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. These soils generally are severely limited for local roads and streets because of frost action, slope, and low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset the slope limitation. Cutting and filling may be necessary. The limitation for septic tank absorption fields is severe because of slope. Installation of a filter field on these slopes is difficult. Grading, or landshaping to modify the slope, and installing the absorption field on the contour can offset this limitation.

This complex is in capability subclass IVe. The woodland suitability subclass is 1o for the Parke soils and 1r for the Chetwynd soils.

PeA—Pekin silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is moderately deep to a fragipan. It is on broad low terraces along drainageways. It is subject to rare flooding. Areas are generally narrow and irregular in shape. They range from 3 to 50 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is dark brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches. It is strong brown, friable silt loam in the upper part; firm silty clay loam that is mottled in shades of brown and gray in the middle part; and a fragipan of mottled grayish and brownish, very firm and brittle silt loam in the lower part. The substratum to a depth of 68 inches or more is mottled light brown, pinkish gray, and reddish yellow silt loam. The subsoil in places is less than 40 inches thick or has no mottles in the upper 10 inches.

Included with this soil in mapping are small areas of well drained Elkinsville soils. Also included are a few small flat or depressional areas of somewhat poorly drained Peoga soils. Elkinsville soils do not have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Pekin soil is moderate. Permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 2 to 6 feet during March and April. Because the fragipan is at a depth of 24 to 36 inches, the water table is perched and root penetration is restricted.

Many areas of this soil are used for cultivated crops,

and some areas are used for hay or pasture. A few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The available water capacity is the main concern in use and management of this soil. The slowly permeable fragipan restricts the downward movement of roots. This soil is wet and seepy in spring but is droughty late in summer. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main concern in management. The fragipan layer limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for dwellings and generally is unsuited for this use because of rare flooding. Wetness is also a severe limitation for houses with basements. It would be better to select an alternate site. This soil is severely limited for local roads because of potential frost action. Drainage ditches along roads lower the water table and help prevent damage from frost action. The limitations for septic tank absorption fields are also severe because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIs and woodland suitability subclass 3o.

PeB—Pekin silt loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is moderately deep to a fragipan. It is on broad low terraces along drainageways. Also, it is subject to rare flooding. Areas are generally narrow and irregular in shape. They range from 3 to 100 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is dark brown silt loam about 5 inches thick. The subsoil is about 49 inches thick. It is yellowish brown, friable silt loam in the upper part; is pale brown and yellowish brown, mottled, firm silty clay loam in the middle part; and has a fragipan of light yellowish brown and brownish yellow, mottled, very firm and brittle silt loam in the lower part. The substratum to a depth of 60 inches or more is light brown, pinkish gray, and reddish yellow stratified silt loam, loam, and sandy loam. In places the subsoil is less than 40 inches thick.

Included with this soil in mapping are small areas of well drained Elkinsville soils. Also included are a few small flat or depressional areas of somewhat poorly drained Bartle soils and poorly drained Peoga soils. Elkinsville soils do not have a fragipan. Inclusions make up about 10 to 15 percent of this unit.

The available water capacity of this Pekin soil is moderate, and permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 2 to 6 feet during March or April. Because the fragipan is at a depth of 24 to 36 inches, the water table is perched and root penetration is restricted.

Many areas of this soil are used for cultivated crops, and some areas are used for hay or pasture. A few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. The very slowly permeable fragipan affects the use and management. The soil is wet and seepy in spring but may be droughty late in summer. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. The fragipan layer limits the effective rooting depth. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting,

or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for dwellings and generally is unsuited to this use because of rare flooding. Wetness is also a severe limitation where houses are constructed with basements. This soil is severely limited for local roads because of potential frost action. Drainage ditches along roads lower the water table and help prevent damage from frost action. The limitations for septic tank absorption fields are also severe because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIe and woodland suitability subclass 3o.

PeC—Pekin silt loam, 6 to 12 percent slopes. This moderately sloping, moderately well drained soil is moderately deep over a fragipan. It is on side slopes of low terraces. Also, it is subject to rare flooding. Areas are generally narrow and irregular in shape. They range from 3 to 50 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 35 inches thick. It is yellowish brown, friable silt loam in the upper part; is yellowish brown, mottled, friable silt loam and silty clay loam in the next part; has a fragipan of yellowish brown, mottled, very firm and brittle silt loam in the next part; and is strong brown, mottled, firm loam in the lower part. The substratum to a depth of 60 inches or more is mottled pale brown, yellowish brown, and light brownish gray stratified loam and silt loam. In places, the fragipan is at a depth of less than 24 inches or the subsoil is less than 40 inches thick where erosion has taken place.

Included with this soil in mapping are small areas of well drained Chetwynd and Parke soils and well drained and moderately well drained Hosmer soils. Also included are small flat or depressional areas of somewhat poorly drained Bartle soils. Chetwynd and Parke soils do not have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Pekin soil is moderate. Permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 2 to 6 feet during March and April. Because the fragipan is at a depth of 24 to 36 inches, the water table is perched and root penetration is restricted.

Many areas of this soil are used for hay or pasture, and some areas are in woodland. A few areas are used for cultivated crops.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in use and management. The very slowly permeable fragipan also affects use and management. This soil is wet and seepy in spring but may be droughty late in summer.

If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. Tillage of the soil when it is too wet results in large clods that become very firm when dry. Soil tilth is often improved by the freeze-thaw action of the soil during the winter.

This soil is well suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. The fragipan layer limits the effective rooting depth. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is generally unsuited to dwellings because of rare flooding. Wetness is also a severe limitation for houses with basements. This soil is severely limited for local roads because of potential frost action. Drainage ditches along roads lower the water table and help prevent damage from frost action. The limitations for septic tank absorption fields are also severe because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIIe and woodland suitability subclass 3o.

Po—Peoga silt loam. This nearly level, deep, poorly drained soil is on broad glacial lake plains and on low alluvial terraces. Areas are generally long and wide. They range from 3 to 300 acres and have a dominant size of about 50 acres.

In a typical profile the surface layer is grayish brown silt loam about 8 inches thick. The subsurface layer is light gray, mottled silt loam about 7 inches thick. The subsoil is about 65 inches thick. It is gray, mottled, firm silt loam in the upper part and gray and dark gray, mottled, firm silty clay loam in the lower part. In places, this soil does not have a horizon of clay accumulation.

Included with this soil in mapping are small slightly convex higher lying areas of somewhat poorly drained Bartle soils and well drained and moderately well drained Hosmer soils. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Peoga soil is very high, and permeability is slow. Surface runoff from cultivated areas is very slow. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 2 to 6 feet from January to May.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

If adequately drained, this soil is suited to corn and soybeans. Small grain is subject to severe damage during periods of prolonged wetness. Wetness is the main concern in the use and management of this soil. It needs adequate drainage and the use of diversions for maximum crop production. Frost and water damage can be reduced by using short season varieties of adapted crops. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these. Diversions need to be placed in the higher lying areas to intercept the surface runoff of the watershed before it reaches the soil. With drainage and proper management this soil is suited to intensive row cropping. Frost and water damage can be reduced by using short season varieties of adapted crops. Late planting of crops helps avoid damage or loss of crops from ponding. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops help control erosion and improve and maintain tilth and organic matter content. In some areas where this soil has fragipan characteristics, the permeability is very slow and the downward movement of roots can be restricted.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged wetness. The wetness of this soil also prohibits the use of most legumes. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition, equipment limitations, seedling mortality, and windthrow hazard are concerns in management. Seasonal wetness hinders harvesting and logging operations and also the planting of seedlings. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites because of wetness. It would be better to select an alternate site, but if this soil is used for dwellings, these areas should be artificially drained. Dwellings should be constructed without basements. Installation of foundation drains and perimeter drains to channel runoff to a storm sewer or other suitable outlets can reduce wetness. Landscaping to remove runoff and drainage ditches lower the water table and remove excess water. This soil is severely limited for local roads and streets because of wetness, potential frost action, and low strength. Drainage ditches lower the water table and help prevent damage from frost. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are severe because of wetness and slow permeability. It would be better to select an alternate site.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

PrC—Princeton loam, 4 to 10 percent slopes. This gently sloping or moderately sloping, deep, well drained soil is on convex ridgetops of the uplands. It is adjacent to large streams. Areas are generally narrow and elongated. They range from 10 to 60 acres and have a dominant size of about 40 acres. This soil has slopes that generally range from 4 to 10 percent, but slopes may range from 2 to 12 percent.

In a typical profile the surface layer is dark brown loam about 7 inches thick. The subsoil is about 61 inches thick. It is yellowish brown and strong brown, firm sandy loam and clay loam in the upper part; strong brown, friable loam in the next part; brown and yellowish brown, friable clay loam in the next part; and strong brown, friable fine sandy loam with thin bands of loam in the lower part. The substratum to a depth of 80 inches or more is yellowish brown stratified fine sand and silt. In places, the soil is strongly acid or very strongly acid or has a higher content of sand throughout.

Included with this soil in mapping are a few small areas of somewhat poorly drained Whitaker soils. Some

small severely eroded areas are on sharp breaks. Inclusions make up 10 to 15 percent of the unit.

The available water capacity of this Princeton soil is moderate. Permeability is moderate in the surface layer and subsoil and moderately rapid in the substratum. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for hay or pasture. A few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation and conservation tillage that leaves all or part of the crop residue on the surface help control erosion and surface runoff. Slopes are generally too short for terraces, diversions, contour farming, or grassed waterways. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. When rainfall is less than normal or is poorly distributed, the soil becomes somewhat droughty and crops are likely to be damaged.

This soil is suited to grasses and legumes for hay or pasture. It is especially good for alfalfa. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and without basements because of slope. Grading the soil and designing structures to complement the slope can offset this limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is moderately limited for local roads and streets because of slope and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset this limitation. Cutting and filling may be necessary. The limitation for septic tank absorption fields is moderate because of slope. Grading, or land shaping to modify the slope, and installing the absorption field on the contour can help offset this limitation.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

PrE—Princeton loam, 18 to 25 percent slopes. This moderately steep, deep, well drained soil is on side slopes of the uplands. It is adjacent to large streams. Areas are generally narrow and elongated. They range from 10 to 60 acres and have a dominant size of about 20 acres. This soil always occurs on the side slopes directly below the gently sloping or moderately sloping soils on ridgetops.

In a typical profile the surface layer is dark brown loam about 6 inches thick. The subsoil is about 36 inches thick. It is strong brown, friable clay loam and loam in the upper part and brown, friable sandy loam in the lower part. The substratum to a depth of 60 inches or more is strong brown loamy sand. In places, the soil ranges from neutral to medium acid in the substratum or has a higher sand content throughout.

Included with this soil in mapping are some small areas of somewhat poorly drained Whitaker soils. In places, the lower part of the slope flattens out as it approaches the drainageway. There are some small areas that are severely eroded on sharp slope breaks where the subsoil is exposed. In some areas the slopes range up to 30 percent. Inclusions make up 10 to 15 percent of the unit.

The available water capacity of this Princeton soil is moderate. Permeability is moderate in the solum and moderately rapid in the substratum. Surface runoff from cultivated areas is rapid. The organic matter content of the surface layer is low.

Many areas of this soil are unsuited to cultivated crops and are used for hay or pasture. A few areas are in woodland.

This soil is generally unsuited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main concerns. A permanent cover of vegetation slows runoff and helps control erosion. Other major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing reduces the density and hardiness of plants. It also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Erosion hazard, equipment limitations, and plant competition are concerns in management. Slope limits the use of certain types of machinery. Erosion may become a concern when vegetation is removed. Unless logging roads are built on the contour, they cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of slope. It is generally not used for this purpose because construction is difficult on these moderately

steep slopes. This soil is severely limited for local roads because of slope. Designing roads and streets to complement the slope can offset this limitation. Cutting and filling may be necessary. Septic tank absorption fields are severely limited because of slope. The soil generally is not used for this purpose.

This soil is in capability subclass VIe and woodland suitability subclass 1r.

RcB—Ryker silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on convex ridgetops of the loess-covered uplands. Areas are generally long and narrow. They range from 3 to 60 acres and have a dominant size of about 10 acres.

In a typical profile the upper part of the surface layer is dark brown silt loam about 3 inches thick, and the lower part is dark brown and dark yellowish brown silt loam about 10 inches thick. The subsoil extends to a depth of 80 inches. It is brown and strong brown, friable silt loam and clay loam in the upper part and yellowish red, friable clay loam and cherty silty clay loam in the lower part. In places, the loess cap is more than 40 inches thick. In a few areas the soil has less clay and formed in glacial till or glacial outwash.

Included with this soil in mapping are a few small depressional areas of somewhat poorly drained Iva soils, small areas of well drained Crider soils and well drained and moderately well drained Hosmer soils that are on the same landform and small areas of Hosmer soils at a higher elevation. Crider soils have a thicker loess cap than the Ryker soil and formed in limestone residuum. Hosmer soils have a fragipan. Most delineations have a few sinkholes. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Ryker soil is high, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is moderate.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. The sinkhole areas limit the effectiveness of most conservation practices.

This soil is well suited to grasses and legumes for hay or pasture. It is especially suited to alfalfa and other deep-rooted legumes (fig. 2). Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing reduces the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, and girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and without basements because of shrinking and swelling. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are moderate because permeability is moderate. Increasing the size of the filter field helps compensate for the restricted permeability.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

RcC—Ryker silt loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on convex ridgetops of the loess-covered uplands. Areas are generally elongated. They range from 3 to 60 acres and have a dominant size of about 10 acres.

In a typical profile the upper part of the surface layer is dark brown silt loam about 7 inches thick, and the lower part is dark yellowish brown silt loam about 5 inches thick. The subsoil is about 66 inches thick. It is strong, friable silt loam and silty clay loam in the upper part; yellowish red, friable clay loam in the middle part; and yellowish red, firm clay in the lower part. Hard limestone bedrock is at a depth of about 78 inches. In places, the loess cap is more than 40 inches thick. In a few areas the soil has less clay and formed in glacial till or glacial outwash.

Included with this soil in mapping are a few small areas of well drained Crider soils and well drained and moderately well drained Hosmer soils. Crider soils have a thicker loess cap than the Ryker soil and formed in limestone residuum. Hosmer soils have a fragipan. Most delineations include some sinkholes. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Ryker soil is high, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is moderate.

Figure 2.—Alfalfa grows well on Ryker silt loam, 2 to 6 percent slopes.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, and grassed waterways help control erosion and surface runoff. Slopes are usually too short for terracing. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. The sinkhole areas limit the effectiveness of most conservation practices.

This soil is well suited to grasses and legumes for hay or pasture. It is especially good for alfalfa and other deep-rooted legumes. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is moderately limited for dwellings with and

without basements because of slope and shrinking and swelling. Foundations, footings, or basement walls need to be designed to withstand shrinking and swelling. Grading the area and designing structures to complement the slope can offset the slope limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are moderate because of slope and moderate permeability. Increasing the size of the filter field helps compensate for the restricted permeability of the subsoil. Grading, or land shaping to modify the slope, and installing the absorption field on the contour can offset the slope limitation.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

RcD—Ryker silt loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on side slopes of the loess-covered uplands. Areas are generally elongated. They range from 3 to 30 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 65 inches thick. It is strong brown, friable silt loam and firm silty clay loam in the upper part; yellowish red, firm clay loam in the middle part; and yellowish red, very firm clay in the lower part. Hard limestone bedrock is at a depth of 72 inches. In places, the loess cap is more than 40 inches thick. In a few areas the soil has less clay and formed in glacial till or glacial outwash.

Included with this soil in mapping are a few small areas of well drained Crider soils on the flatter part of the unit and small areas of well drained Crider and Hagerstown soils that are on the more sloping part of the unit. There are small severely eroded areas on nose slopes and sharp slope breaks. Crider and Hagerstown soils formed in limestone residuum. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Ryker soil is high, and permeability is moderate. Surface runoff from cultivated areas is rapid. The organic matter content of the surface layer is moderate.

This soil is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, and contour farming help control erosion and surface runoff. The sinkhole areas limit the effectiveness of most conservation practices. Slopes are generally too short for terracing. Conservation tillage that leaves all or part of the crop residue on the surface, crop residue management, green manure crops, and cover crops also improve and help maintain tilth and organic matter content.

Many areas are used for hay or pasture. This soil is suited to grasses and legumes for hay or pasture. It is especially good for alfalfa and other deep-rooted legumes. Rapid runoff and the hazard of erosion are the main concerns. Permanent vegetative cover slows runoff and helps control erosion. Plowing on the contour or conservation tillage helps control erosion when preparing the seedbed. Other major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites because of slope. The selection of an alternate site may be necessary. Grading the area and designing structures to complement the slope can offset this limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of slope, low strength, and frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope can offset this limitation. Cutting and filling may be necessary but may be limited by the depth to bedrock. The limitation for septic tank absorption fields is severe because of slope. Machinery is difficult to operate on this strongly sloping soil. Grading, or land shaping to modify the slope, and installing the absorption field on the contour can offset the slope limitation.

This soil is in capability subclass IVe and woodland suitability subclass 1o.

Sf—Steff silt loam. This nearly level, deep, moderately well drained soil is on broad flats and narrow stream channels on acid bottom land. It is subject to frequent flooding from January to May for brief periods. Areas are generally variable in size and shape. They range from 3 to 160 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is brown silt loam

about 10 inches thick. The subsoil is about 39 inches thick. It is yellowish brown, friable silt loam in the upper part and yellowish brown, mottled, friable silt loam in the lower part. The substratum to a depth of 60 inches is light olive brown, mottled silt loam. In places, the soil contains less clay in the subsoil and ranges from medium acid to neutral throughout. In a few small areas, gray mottles are within the upper part of the subsoil.

Included with this soil in mapping are small areas of well drained Burnside soils on the upper end of drainageways and small concave lower lying areas of poorly drained Bonnie soils and somewhat poorly drained Stendal and Wakeland soils. Burnside soils contain more coarse fragments throughout than the Steff soil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Steff soil is very high, and permeability is moderate. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is low. A seasonal high water table is at a depth of 1.5 to 3 feet from December to April.

Many areas of this soil are used for cultivated crops. Some of tne areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. With proper management, this soil is suited to intensive row cropping. Flooding is the main concern. Fall planted small grain is subject to severe damage during periods of prolonged flooding. Frost and flood damage can be reduced by using short-season varieties of adapted crops. Late planting of crops helps avoid damage or loss from clodding. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and crop residue management improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for pasture or hay. This soil is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seasonal wetness and flooding hinder harvesting and logging operations and also the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for dwellings and is generally not used for this purpose because of flooding. Wetness is also a limitation for houses with basements. This soil is severely limited for local roads because of frequent flooding, low strength, and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Elevating the roadbed helps to prevent some of the damage caused by flooding. The limitations for septic tank absorption fields are severe because of wetness and flooding.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

St—Stendal silt loam. This nearly level, deep, somewhat poorly drained soil is on broad flats and narrow stream channels on acid bottom land. It is subject to frequent flooding from January to May for brief periods. Areas are generally variable in size and shape. They range from 3 to 150 acres and have a dominant size of about 25 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsoil is 41 inches thick. It is light brownish gray, mottled, friable silt loam in the upper part and pale brown, mottled, friable silt loam in the lower part. The substratum to a depth of 60 inches is light brownish gray, mottled silt loam. In places, the soil contains less clay in the subsoil and ranges from medium acid to neutral throughout.

Included with this soil in mapping are small areas of poorly drained Bonnie soils and the very poorly drained, frequently flooded Zipp soils. Also included are small convex higher lying areas of well drained Burnside, Cuba, and Haymond soils and moderately well drained Steff and Wilbur soils. Inclusions make up about 10 to 15 percent of this unit.

The available water capacity of this Stendal soil is very high, and permeability is moderate. Surface runoff from cultivated areas is very slow. The organic matter content of the surface layer is moderate. A seasonal high water table is at a depth of 1 to 3 feet from January to May.

Many areas of this soil are drained and are used for most cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is well suited to corn and soybeans. Small grain planted in fall is subject to severe damage during periods of prolonged flooding. Wetness and flooding are the main concerns in use and management. This soil needs adequate drainage for maximum crop production. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these practices. This soil is suited to intensive row cropping if it has drainage and proper management. Frost and flood damage can be reduced with the use of short-season varieties of adapted crops. Late planting of crops helps avoid damage or loss from flooding. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface, and green manure crops improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and water-tolerant legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Frequent flooding and seasonal wetness hinder harvesting and logging operations and also the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites and is generally not used for this purpose because of frequent flooding and wetness. It would be better to select an alternate site. This soil is severely limited for local roads because it is subject to frequent flooding and potential frost action. Drainage ditches are needed along roads and streets to lower the water table and help prevent damage from frost action. Elevating the roadbed helps overcome wetness and flooding. The limitations for septic tank absorption fields are also severe because of wetness and flooding.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

Sx—Stonelick silt loam. This nearly level, deep, well drained soil is on broad flood plains. It is adjacent to large streams. This soil is subject to frequent flooding from November to June for very brief periods. Areas are generally broad and irregular in shape. They range from 10 to 300 acres and have a dominant size of about 200 acres.

In a typical profile the surface layer is dark brown silt loam about 11 inches thick. The substratum to a depth of 60 inches or more is dark brown, dark yellowish brown, or yellowish brown, friable loam or fine sandy loam. In places, the soil is underlain with bedrock within a depth of 40 inches. In a few small areas the soil has carbonates within a depth of 40 inches, and in other places the soil does not contain carbonates. There are small areas of coarser textured soils on narrow, elongated natural levees.

Included with this soil in mapping are small areas of somewhat poorly drained Wakeland soils and moderately well drained Wilbur soils. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Stonelick soil is high, and permeability is moderately rapid. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is low.

Many areas of this soil are used for cultivated crops. Some of the areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. With proper management, this soil is suited to intensive row cropping. Flooding is the main concern. Small grain planted in fall is subject to severe damage during periods of prolonged flooding. Some areas can be protected from flooding by the construction of levees. Flood damage can be reduced with the use of short-season varieties of adapted crops. Late planting of crops helps avoid damage or loss of crops from flooding. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and crop residue management improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for pasture or hay. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged flooding. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Flooding may hinder harvesting and logging operations and also the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites and is generally not used for this purpose because of frequent flooding. It would be better to select an alternate site. It is severely limited for local roads because it is subject to flooding. Septic tank absorption fields are also severely limited by flooding.

This soil is in capability subclass 2w and woodland suitability subclass 2o.

TIA—Tilsit silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is moderately deep to a fragipan. It is on broad convex ridgetops of the loess-covered uplands. Areas are generally broad and irregular in shape. They range from 3 to 100 acres and have a dominant size of about 20 acres.

In a typical profile the surface layer is brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. It is yellowish brown, friable silt loam in the upper part; is mottled yellowish brown and brown, firm silt loam

in the middle part; and has a fragipan of mottled grayish brown, yellowish brown, pale brown, and light brownish gray, very firm and brittle silty clay loam in the lower part. The substratum, which extends to a depth of 54 inches, is mottled grayish brown, yellowish brown, pale brown, and light brownish gray silty clay loam. Sandstone bedrock is at a depth of 54 inches. In places, the soil has a loess cap more than 48 inches thick or a redder subsoil.

Included with this soil in mapping are small areas of well drained Crider, Gilpin, Hagerstown, and Wellston soils on the more sloping parts of the unit. Also included are a few small depressional areas of somewhat poorly drained Iva soils. Inclusions do not have a fragipan and make up about 10 to 15 percent of the unit.

The available water capacity is moderate, and permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 1.5 to 2.5 feet from January to April. Because the fragipan is at a depth of 18 to 28 inches, the water table is perched and root penetration is restricted.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The very slowly permeable fragipan is the main concern in use and management. The soil is wet and seepy in spring but may become droughty late in summer. The fragipan restricts the downward movement of roots. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops help control erosion and improve and maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. The main concern in management is plant competition. A fragipan layer limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Addtional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil has moderate limitations for dwellings without basements because of wetness. It is severely limited for dwellings with basements because of wetness. Foundation drains, proper landscaping to remove runoff, and drainage ditches lower the water table and remove excess water. This soil is severely limited for local roads and streets because of its low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. The limitation for septic tank absorption fields is also severe because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIw and woodland suitability subclass 3o.

TlB—Tilsit silt loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is moderately deep to a fragipan. It is on narrow and broad ridgetops of the loess-covered uplands. Areas are generally narrow and long. They range from 3 to 70 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is brown silt loam about 9 inches thick. The subsoil is about 49 inches thick. It is yellowish brown, friable silty clay loam in the upper part; has a fragipan of mottled yellowish brown and light brownish gray, very firm and brittle silty clay loam in the middle part; and is mottled brown, yellowish brown, light brownish gray, and gray, firm channery silty clay loam in the lower part. Sandstone bedrock is at a depth of 58 inches. In places, the subsoil and substratum contain chert and geodes, the loess is more than 48 inches thick, or the subsoil is redder.

Included with this soil in mapping are small areas of well drained Crider, Gilpin, Hagerstown, and Wellston soils on the more sloping parts of the unit. Also included are small flat or depressional areas of somewhat poorly drained Iva soils. In small severely eroded areas the soil is on nose slopes and sharp slope breaks. Inclusions make up 15 to 20 percent of the unit.

The available water capacity is moderate, and permeability is moderate above the fragipan and very slow within the fragipan. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 1.5 to 2.5 feet from January to April. Because the fragipan is at a depth of 18 to 28 inches, the water table is perched and root penetration is restricted.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. The very slowly permeable

fragipan affects use and management. This soil is wet and seepy in spring but may be droughty late in summer. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help control erosion and surface runoff. Crop residue management and green manure crops improve and maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay and pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main management concern. A fragipan layer limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is moderately limited for dwellings without basements and severely limited for dwellings with basements because of wetness. Foundation drains, proper landscaping to remove runoff, and drainage ditches lower the water table and remove excess water. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. The limitation for septic tank absorption fields is also severe because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIe and woodland suitability subclass 3o.

Ua—Udorthents, loamy. These nearly level to moderately sloping, deep, well drained to somewhat poorly drained soils are in disturbed areas of the uplands and flood plains. Areas range from 5 to 300 acres and have a dominant size of about 20 acres.

These soils are generally located around highway interchanges, shopping centers, subdivisions, parking lots, and factories. In most places they have been cut, built up, or smoothed. In some places deep cuts have been made in the landscape, and the original soil material has been transported to other areas where it has been used to fill in lower lying areas or provide fill for highway grades, overpasses, and exit ramps. In other places the upper part of the soil material has been scraped away, leaving a smoother, more level landscape where a mixture of subsoil and substratum is exposed at the surface.

In a typical area of Udorthents where the soil has been built up, there is a mixture of surface soil, subsoil, substratum, small pieces of limestone, pieces of concrete, bricks, or pieces of asphalt. It is silt loam, silty clay loam, or clay that may be mixed with any amount of waste material. In a typical area where the soil has been cut or scraped away, the remaining material is a thin subsoil or substratum underlain by limestone or sandstone bedrock.

Most delineations include a few short, steep slopes; severely eroded areas; and depressions that stay wet for long periods. Also included are a few small areas of undisturbed soils.

The available water capacity of the Udorthents is moderate, and permeability is moderate or moderately slow. Surface runoff is slow to rapid. Organic matter content of the surface layer is low. A seasonal high water table is at a depth of 1.5 to 6 feet. The reaction of the profile ranges from slightly acid to extremely acid.

Most areas are surrounded by heavily travelled highways, parking lots, shopping centers, factories, and houses. Many areas have small patches of native grasses or low-growing shrubs. Some areas have been seeded to permanent grasses.

These soils are fairly to poorly suited to farming and building sites and sanitary facilities because of various modifications made by man. They are so variable that an onsite investigation is required for all possible uses.

These soils are generally unsuited to corn, soybeans, and small grain. The hazard of erosion and the mixture of waste materials within the soil are the main concerns in use and management.

These soils are suited to grasses and legumes for hay or pasture. They are poorly suited to deep-rooted legumes, however, because waste materials are mixed in with the soil. Special management is needed. An intensified fertilization program with special emphasis on use of organic residue or manure is needed if these areas are to be placed into production. A permanent cover of vegetation slows runoff and helps control erosion. Plowing on the contour or conservation tillage helps control erosion when preparing the seedbed. Cover crops should be planted on exposed areas as soon as possible to help control erosion. Drainage is needed in the nearly level areas.

These soils are poorly suited to trees. Seasonal wetness may hinder harvesting and logging operations and also the planting of seedlings. The presence of waste materials mixed in with the soil material limits the

effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. Generally, these soils are not suited to black walnut plantings or high quality woods.

An onsite investigation is needed if these soils are to be used for urban development. The depth to the water table and its relation to possible frost action should be considered. Because soil material is quite variable, engineering test data should be collected. The soil properties significant to the design of a structure vary from one location to another.

This map unit is not assigned to interpretive groupings.

Ud—Udorthents-Pits complex. This complex consists of nearly level to very steep soils in quarried areas of the uplands and on flood plains. These soils are deep to very shallow and well drained. This complex is 52 to 60 percent soils, 23 to 31 percent Pits, and 9 to 25 percent areas of stones and boulders. It consists of areas of disturbed soils, limestone quarries, a few sandstone quarries, and rubble land. Areas are generally rectangular. They range from 10 to 200 acres and have a dominant size of about 40 acres. The entire delineation has areas of Pits and stones and boulders so intermingled or small in area that they could not be shown separately at the scale selected for mapping.

In a typical area of Udorthents, the surface layer and part of the subsoil have been scraped away, and the remaining subsoil has been mixed with substratum and pieces of limestone. This material is underlain by limestone or sandstone bedrock.

The open excavations, or Pits, range from 5 to 100 acres. They range in depth from 25 to more than 200 feet. A large number of the Pits have been abandoned for many years, and most of the deeper ones contain some water. Some Pits have had piles of large waste rock dumped into them. The limestone or sandstone rock is exposed on the walls. Generally, the Pits support few or no plants. In some of the smaller, abandoned Pits, where soil has accumulated in the bottom, vegetation, such as weeds, shrubs, trees, and wild grasses, has become established.

The areas of stones and boulders have waste rock, spoil, and general refuse left from quarrying operations piled on the surface. These areas generally develop a dense cover of shrubs, trees, and grasses. The density of the cover depends on how long the pit has been abandoned. Some Pits support no vegetation.

Included with this complex in mapping are small areas of Caneyville, Crider, and Hagerstown soils. In places, small areas of Alford, Hickory, Parke, and Ryker soils are included. These areas have been abandoned for a long time and generally support the most vegetation. The size of the trees depends on how long the Pits have been abandoned.

The available water capacity of this complex ranges from very low to high. Permeability is variable. Runoff is very slow to very rapid. Organic matter content of the surface material is moderate or low. The reaction of the profile is neutral to extremely acid.

This unit is restricted in its use and management by open excavations and piles of waste rock. Major reclamation is required. Many areas have small patches of native grasses or low shrubs. Some areas have established natural stands of timber. This unit is generally unsuited to farming, building sites, and sanitary facilities. Onsite investigation is required to determine its suitability for all uses.

This unit is poorly suited to trees. It is best suited to wildlife, recreation, and limited timber production. It is not a good site, however, for high quality woods.

If this soil is used for building sites and sanitary facilities, an onsite soil investigation is needed. The soil properties that are significant to the design of a structure vary from one location to another. Open excavations or pits may be a health and safety hazard. The areas that have less waste rock have the most potential for scattered, random building sites, but the waste rock must be removed before they can be used for this purpose. Protective plant cover must be established as quickly as possible to keep erosion losses to a minimum. The limitations for local roads and streets and sanitary facilities are variable. Onsite investigations are needed. Special attention should be given to permeability, slope, and depth to rock.

This map unit is not assigned to interpretive groupings.

Wa—Wakeland silt loam. This nearly level, deep, somewhat poorly drained soil is on broad flats on bottom land and in narrow areas along streams. It is subject to frequent flooding from January to May for brief periods. Areas are generally variable in size and shape. They range from 3 to 100 acres and have a dominant size of about 20 acres.

In a typical profile the surface layer is dark brown silt loam about 9 inches thick. The substratum to a depth of 60 inches is grayish brown, pale brown, and light brownish gray silt loam. In places the soil is more than 18 percent clay or is strongly acid or very strongly acid throughout.

Included with this soil in mapping are small areas of poorly drained Bonnie soils and the very poorly drained, frequently flooded Zipp soils. Also included are small convex higher lying areas of well drained Burnside, Cuba, and Haymond soils and moderately well drained Wilbur soils. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Wakeland soil is very high, and permeability is moderate. Surface runoff from cultivated areas is very slow. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at a depth of 1 to 3 feet from January to April.

Many areas of this soil are used for cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is well suited to corn and soybeans. Small

grain planted in fall is subject to severe damage during periods of prolonged flooding. Wetness and flooding are the main concerns that affect use and management. This soil needs adequate drainage for maximum crop production. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these. This soil is suited to intensive row cropping if it has drainage and proper management. Frost and flood damage can be reduced with the use of short season varieties of adapted crops. Late planting of crops helps avoid damage or loss from flooding. Conservation tillage that leaves all or part of the crop residue on the surface, crop residue management, and green manure crops improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Frequent flooding and seasonal wetness may cause a slight delay in harvesting and logging operations and also in the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites and generally is unsuited to this use because it is subject to frequent flooding and wetness. It would be better to select an alternate site. This soil is severely limited for local roads because of frequent flooding and potential frost action. Drainage ditches are needed along roads and streets to lower the water table and help prevent damage from frost action. The limitations for septic tank absorption fields are also severe because of wetness and flooding. It would be better to select an alternate site.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

WeC—Wellston silt loam, 6 to 12 percent slopes. This moderately sloping, well drained soil is on narrow ridgetops and on side slopes of the uplands. Areas are generally long and irregular in shape. They range from 3 to 40 acres and have a dominant size of about 15 acres.

In a typical profile the upper part of the surface layer is brown silt loam about 1 inch thick, and the lower part is yellowish brown silt loam about 5 inches thick. The subsoil is about 35 inches thick. It is dark yellowish brown, friable silt loam in the upper part; strong brown and yellowish brown, friable silty clay loam in the middle part; and yellowish brown, mottled, friable silty clay loam in the lower part. The substratum, which extends to a depth of 50 inches, is mottled pale brown, yellowish brown, light yellowish brown, and light brownish gray channery silt loam. Hard sandstone bedrock is at a depth of about 50 inches. In places, the bedrock is within a depth of 40 inches or is below a depth of 72 inches.

Included with this soil in mapping are small areas of well drained Berks, Caneyville, Crider, and Hagerstown soils on the more sloping parts of the unit. Small areas of well drained Crider and Zanesville soils and moderately well drained Bedford, Hosmer, and Tilsit soils are on the less sloping part of the unit. Also, somewhat poorly drained Iva soils are in a few depressional areas. Small severely eroded areas are on nose slopes and sharp slope breaks, and a few rock outcrops and a few sinkholes are in some units. Caneyville, Crider, and Hagerstown soils formed in limestone residuum, and Bedford, Hosmer, Tilsit, and Zanesville soils have a fragipan. Inclusions make up about 5 to 20 percent of the unit.

The available water capacity of this Wellston soil is moderate, and permeability is moderate. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low.

Many areas of this soil are used for hay or pasture. Some areas are used for cultivated crops, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, diversions, contour farming, and grassed waterways help control erosion and surface runoff. Slopes are generally too short for terracing. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture. Major concerns of management are overgrazing or grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting,

or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is limited for dwellings without basements because of slope. It is moderately limited for dwellings with basements because of depth to rock and slope. Grading the area to modify the slope and designing structures to complement the slope can offset this limitation. Building designs should take into account the depth to rock. Exposed areas should be revegetated as soon as possible after construction to control soil erosion. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material.

The limitation for septic tank absorption fields is moderate because of depth to rock, slope, and moderate permeability. Grading, land shaping to modify the slope, and installing the absorption field on the contour can help offset the slope limitation. Increasing the size of the filter field helps compensate for the restricted permeability. There should be sufficient thickness of soil material below the bottom of the trenches or seepage bed to provide adequate filtration and purification of septic tank effluent.

This soil is in capability subclass IIIe and woodland suitability subclass 2o.

WmC—Wellston-Gilpin silt loams, 6 to 20 percent slopes. This complex consists of moderately sloping to moderately steep, moderately deep and deep, well drained soils on ridgetops and side slopes of the uplands. It is about 45 percent Wellston soils and 35 percent Gilpin soils. Areas are generally narrow and elongated. They range from 3 to 400 acres and have a dominant size of about 60 acres. The Wellston soils are on ridgetops that have slopes of 6 to 12 percent are 40 to 600 feet in length. The Gilpin soils are on long convex ridges that have slopes of 12 to 20 percent. These soils are so intermingled or so small in area that they could not be shown separately at the scale selected for mapping.

In a typical profile of the Wellston soil, the surface layer is dark brown silt loam about 4 inches thick. The subsoil is about 42 inches thick. It is brown and strong brown, friable silt loam in the upper part; yellowish brown, friable silty clay loam in the middle part; and strong brown, friable channery silty clay loam in the lower part. Sandstone bedrock is at a depth of 46 inches. In places, the soil has bedrock within 40 inches of the surface, less clay in the subsoil, a thicker subsoil, or bedrock below a depth of 72 inches.

In a typical profile of the Gilpin soil, the surface layer is brown and yellowish brown silt loam about 5 inches thick. The upper part of the subsoil is yellowish brown, friable silty clay loam, and the lower part is pale brown, strong brown, and yellowish red, friable channery silt loam. Sandstone bedrock is at a depth of about 27 inches. In places the subsoil and substratum are thicker, and the subsoil contains less clay.

Included with this complex in mapping and making up about 10 percent of the unit are soils that do not have a clay-enriched horizon. Also on the broad flats of the clay-enriched ridgetops are small areas of moderately well drained Bedford and Tilsit soils. Small areas of well drained Berks and Weikert soils are on the more sloping parts of the unit. Bedford and Tilsit soils have a fragipan. Berks and Weikert soils do not have a fragipan. In places the soils contain large amounts of chert and geodes which are the remnants of the thin layer of limestone bedrock that was underlain by sandstone or shale. Some delineations contain a few rock outcrops, bedrocke scarpments, and short steep slopes. Inclusions make up about 20 percent of the unit.

The available water capacity is moderate for Wellston soils and low for Gilpin soils. The permeability for both soils is moderate. Surface runoff is medium for Wellston soils and rapid for Gilpin soils. The organic matter content of the surface layer is low for both soils. Reaction of the surface layer is strongly acid or very strongly acid, unless the soil is limed.

Many areas of the unit are in woodland. A few areas are used for hay or pasture.

This unit is poorly suited to corn, soybeans, and small grain. The very severe hazard of erosion and the steepness of slope limit its use for row crops and small grain. Conservation practices are needed to help control erosion and surface runoff where crops are grown. The cultivated areas are generally small and are surrounded by woodland. This limits the types of conservation practices that can be used. The Gilpin soil is also limited by depth to bedrock. Conservation practices are needed, such as conservation tillage that leaves all or part of the crop residue on the surface, crop rotation, contour farming, and grassed waterways. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content. When rainfall is less than normal or is poorly distributed, this unit becomes somewhat droughty and crops are likely to be damaged.

This unit is suited to grasses and legumes. Excessive runoff and the very severe hazard of erosion are the main concerns. The depth to bedrock is also a limitation for a part of the unit. Deep-rooted legumes generally do poorly because rooting depth is restricted by the depth to bedrock. A permanent cover of vegetation slows runoff and controls erosion. Plowing on the contour and conservation tillage help control erosion when preparing the seedbed. Other major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely

deferment of grazing help keep the pasture and soil in good condition.

This unit is well suited to trees. Plant competition is the main management concern. Unless logging roads are built on the contour, they cause excessive erosion. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, the Gilpin soil is not suited to black walnut plantings.

This unit dominantly is moderately limited for building sites. Dwellings without basements are limited because of depth to rock and slope. The Gilpin soil is less suitable than the Wellston soil for building sites because it is steeper. The depth to rock should be considered in the design of buildings. Grading the area and designing structures to complement the slope can help offset the slope limitation. Topsoil should be stockpiled and spread over areas where vegetation is difficult to establish. This unit dominantly is severely limited for local roads and streets because of potential frost action and slope. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Designing roads and streets to complement the slope helps offset this limitation. Cutting and filling may be necessary but may be limited by depth to rock.

This unit dominantly is moderately limited for septic tank absorption fields because of the depth to rock, slope, and moderate permeability. Depth to rock and slope are extremely hard to overcome on the moderately steep Gilpin soil. Grading, land shaping to modify the slope, and installing the absorption field on the contour can help offset the slope limitation. Increasing the size of the filter field helps compensate for the restricted permeability of the soils.

This complex is in capability subclass IIIe and woodland suitabilty subclass 2o.

Wo—Whitaker loam. This nearly level or gently sloping, deep, somewhat poorly drained soil is on terraces which are adjacent to large streams. Areas are generally oblong. They range from 5 to 15 acres and have a dominant size of about 15 acres.

In a typical profile the surface layer is dark brown loam about 8 inches thick. The subsoil is about 67 inches thick. It is pale brown, mottled, friable sandy clay loam in the upper part, and mottled dark gray, grayish brown, gray, strong brown and light yellowish brown, firm clay loam and sandy clay loam in the lower part. The substratum to a depth of 80 inches is strong brown, mottled stratified loamy sand and loam. Lacustrine clay is generally beneath the stratified materials. Small areas of soil range from neutral to medium acid in the lower part of the profile. In places, the subsoil and substratum are redder.

Included with this soil in mapping are a few small areas of somewhat poorly drained Bartle soils and small convex higher lying areas of well drained Elkinsville and Martinsville soils. Also included are small depressional areas of the very poorly drained, frequently flooded Zipp soils and somewhat poorly drained Zipp Variant soils. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Whitaker soil is high, and permeability is moderate. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate. A seasonal high water table is at a depth of 1 to 3 feet from January to April.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is the main concern in use and management. This soil needs adequate drainage for maximum crop production. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these. This soil is suited to intensive row cropping if it has drainage and proper management. Frost damage can be reduced with the use of short-season varieties of adapted crops. Conservation practices such as conservation tillage that leaves all or part of the crop residue on the surface and green manure crops improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged wetness. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees, but only a few areas are in woodland. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites because of wetness. It would be better to select an alternate site. If this soil is used for dwellings, it should be artificially drained. This soil is severely limited for local roads and streets because of low strength and potential frost action. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Drainage ditches are needed along roads to lower the water table and help prevent damage from frost action. The limitations for septic tank absorption fields are also severe because of wetness. Perimeter drains around the

filter field lower the seasonal high water table.

This soil is in capability subclass IIw and woodland suitability subclass 3o.

Wr—Wilbur silt loam. This nearly level, deep, moderately well drained soil is on broad flats and narrow stream channels on bottom land. It is subject to frequent flooding from January to May for brief periods. Areas are generally variable in size and shape. They range from 3 to 40 acres and have a dominant size of about 5 acres.

In a typical profile the surface layer is dark brown silt loam about 10 inches thick. The substratum to a depth of 60 inches is dark brown silt loam in the upper part; dark brown and dark grayish brown, mottled silt loam in the middle part; and mottled pale brown, dark yellowish brown, and grayish brown stratified loam and silt loam in the lower part. In places, this soil is more than 18 percent clay in the upper part of the substratum and is strongly acid or very strongly acid throughout. A few areas do not have gray mottles in the lower part of the substratum.

Included with this soil in mapping are small areas of well drained Burnside soils on the upper end of drainageways and small, concave, lower lying areas of poorly drained Bonnie soils and somewhat poorly drained Stendal and Wakeland soils. The Burnside soils contain more coarse fragments throughout than the Wilbur soil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Wilbur soil is very high, and permeability is moderate. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is moderate. A seasonal high water table is at a depth of 3 to 6 feet during March and April.

Many areas of this soil are used for cultivated crops. Some of the areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. With proper management, it is suited to intensive row cropping. Flooding is the main concern. Small grain planted in fall is subject to severe damage during periods of prolonged flooding. Frost and flood damage can be reduced with the use of short-season varieties of adapted crops. Late planting of crops helps avoid damage or loss from flooding. Conservation practices, such as conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and crop residue management improve and help maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for pasture or hay. It is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Frequent flooding may hinder harvesting and logging operations and also the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees.

This soil is severely limited for building sites and is generally not used for this purpose because it is subject to frequent flooding. It would be better to select an alternate site. This soil is severely limited for local roads because of flooding and potential frost action. The upper layer should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are severe because of wetness and frequent flooding. Selection of an alternate site is advised.

This soil is in capability subclass IIw and woodland suitability subclass 1o.

ZnC—Zanesville silt loam, 6 to 12 percent slopes. This moderately sloping, well drained soil is moderately deep to a fragipan. It is on side slopes of the loess-covered uplands. Areas are generally long and narrow. They range from 5 to 70 acres and have a dominant size of about 10 acres.

In a typical profile the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 42 inches thick. It is strong brown and yellowish brown, friable silty clay loam in the upper part; is mottled yellowish brown and pale brown, friable silty clay loam in the next part; has a fragipan of mottled yellowish brown, dark yellowish brown, and light brownish gray, very firm and brittle silty clay loam in the next part; and yellowish brown, mottled, firm silty clay in the lower part. The substratum, which extends to a depth of 60 inches, is strong brown silty clay in the upper part and brownish yellow, mottled clay loam in the lower part. Hard sandstone bedrock is at a depth of about 60 inches. In places, the loess cap is more than 48 inches thick.

Included with this soil in mapping are small areas of well drained Caneyville, Crider, Gilpin, Hagerstown, and Wellston soils on the more sloping parts of the unit and moderately well drained Bedford and Tilsit soils and well drained Crider soils on the broader flatter areas. Some small areas of severely eroded soils are also included. Caneyville, Crider, Gilpin, and Hagerstown soils do not have a fragipan. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Zanesville soil is moderate, and permeability is moderate above the fragipan and slow within the fragipan. Surface runoff from cultivated areas is medium. The organic matter content of the surface layer is low. This soil has a seasonal high water table at a depth of 2 to 3 feet from December to April. Because the fragipan is at a depth of

23 to 32 inches, root penetration is restricted and the water table is perched.

Many areas of this soil are used for hay or pasture. Some areas are used for cultivated crops, and a few areas are in woodland.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main concern in the use and management of this soil. The slowly permeable fragipan affects use and management. The soil is wet and seepy in spring but may be droughty late in summer. If cultivated crops are grown, crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures help control erosion and surface runoff. Crop residue management, green manure crops, and cover crops also help control erosion and improve and maintain tilth and organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the slowly permeable fragipan restricts the downward movement of roots. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction, excessive runoff, and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main concern in management. The fragipan layer limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is moderately limited for dwellings without basements because of wetness and slope. It is severely limited for dwellings with basements because of wetness. Foundation drains, proper landscaping to remove runoff, and drainage ditches lower the water table and remove excess water. Grading the area and designing structures to complement the slope can offset the slope limitation. During construction the surface should not be exposed for long periods. Planting cover crops as soon as possible helps control erosion. Topsoil should be stockpiled and spread over areas where vegetation is hard to establish. This soil is moderately limited for local roads and streets because of slope and low strength. Designing roads and streets to complement the slope can help offset the slope limitation. The upper layer of the soil should be replaced or strengthened with a more suitable base material.

The limitations for septic tank absorption fields are severe because of wetness and the very slowly permeable fragipan. Perimeter drains around the filter field lower the seasonal high water table. Increasing the size of the filter field helps compensate for the restricted permeability of the fragipan. In places the fragipan has been excavated and the trenches filled with gravel. This makes possible the use of the more permeable material below the fragipan and also increases the storage capacity of the filter field.

This soil is in capability subclass IIIe and woodland suitability subclass 3o.

Zo—Zipp silty clay loam. This nearly level, deep, very poorly drained soil is on broad terraces. It is frequently ponded by surface runoff from the adjacent higher lying areas. Areas are generally broad and irregular in shape. They range from 3 to 80 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is dark brown silty clay loam about 7 inches thick. The subsoil is about 26 inches thick. It is grayish brown, mottled, firm silty clay loam in the upper part; grayish brown, mottled, firm silty clay in the middle part; and gray, mottled, firm silty clay in the lower part. The substratum to a depth of 70 inches is mottled gray, brownish yellow, and strong brown clay. In places, the soil has a silt loam surface layer, a strongly acid surface layer and subsoil, a horizon of clay accumulation, or a dark-colored surface layer more than 10 inches thick.

Included with this soil in mapping are small, slightly convex, higher lying areas of somewhat poorly drained Bartle soils. Inclusions make up 3 to 6 percent of the unit.

The available water capacity of this Zipp soil is moderate, and permeability is very slow and slow. Surface runoff from cultivated areas is very slow or ponded. The organic matter content of the surface layer is moderate. This soil has a seasonal high water table at or above the surface from December to May.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

If adequately drained, this soil is suited to corn and soybeans. Ponding and wetness are the main concerns in the use and management of this soil. Small grain is subject to severe damage during periods of prolonged wetness. This soil needs adequate drainage and the use of diversions for maximum crop production. The clayey nature of the subsoil restricts the use of subsurface drains. Excess water can be removed by open ditches and surface drains. Diversions need to be placed on the higher lying areas to intercept the surface runoff from the watershed. This soil is suited to intensive row cropping if it has drainage and proper management. Frost and water damage can be reduced with the use of short-season varieties of adapted crops. Late planting of crops helps avoid damage or loss of crops from ponding. Tillage of the soil when it is too wet results in large clods that become very firm when dry. Soil tilth is often improved by the freeze-thaw action of the soil during the winter. Conservation tillage that leaves all or part of the crop

residue on the surface, green manure crops, and cover crops also improve and help maintain tilth and organic matter content.

Although this soil is suited to grasses and water-tolerant legumes for hay or pasture, it is generally not adequately drained or protected from surface runoff. Diversions in the higher lying areas are needed to intercept excessive runoff before it reaches this soil. The clayey nature of the subsoil restricts the use of the subsurface drainage. Open ditches and surface drains can be used to drain this soil. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of ponding. The wetness of this soil also limits its use for most legumes. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition, equipment limitations, seedling mortality and windthrow hazard are concerns in management. Seasonal wetness hinders harvesting and logging operations and also the planting of seedlings. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites because of shrinking and swelling and ponding. It would be better to select an alternate site. Areas used for building sites should be artificially drained and protected from ponding. Dwellings should be constructed without basements and the foundations and footings designed to prevent structural damage caused by shrinking and swelling. Foundation drains, proper landscaping to remove runoff, and drainage ditches lower the water table and remove excess water. This soil is severely limited for local roads and streets because of ponding and low strength. Drainage ditches are needed along roads to lower the water table and prevent damage caused by ponding. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are also severe because of ponding and permeability which is slow and very slow. It would be better to select an alternate site.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

Zp—Zipp silty clay loam, frequently flooded. This nearly level, deep, very poorly drained soil is on broad bottom land. It is subject to frequent flooding from December to May for brief periods. Areas are generally broad and irregular in shape. They range from 3 to 200 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is dark gray, mottled silty clay loam about 8 inches thick. The subsoil is about 32 inches thick. It is dark gray and gray, mottled, firm silty clay in the upper part and mottled dark gray, gray, yellowish brown, and strong brown, firm clay in the lower part. The substratum to a depth of 60 inches is gray, mottled silty clay. In places, the soil has a silt loam surface layer, a strongly acid surface layer and subsoil, a horizon of clay accumulation, or a dark-colored surface layer more than 10 inches thick.

Included with this soil in mapping are small, slightly convex, higher lying areas of somewhat poorly drained Stendal, Wakeland, and Zipp Variant soils. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Zipp soil is moderate, and permeability is very slow and slow. Surface runoff from cultivated areas is very slow or ponded. The organic matter content of the surface layer is moderate. The surface layer can be tilled only throughout a narrow range in moisture content. This soil has a seasonal high water table at a depth of 0 to 1 foot from December to May.

Many areas of this soil have been drained. They are used for most cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

If adequately drained, this soil is suited to corn and soybeans. Flooding and wetness are the main concerns in use and management. Small grain is subject to severe damage during periods of prolonged flooding. This soil needs adequate drainage for maximum crop production. The clayey nature of the subsoil restricts the use of subsurface drains. Excessive water can be removed by open ditches and surface drains. This soil is suited to intensive row cropping if it has drainage and proper management. Frost and water damage can be reduced with the use of short-season varieties of adapted crops. Late planting of crops helps avoid damage or loss from flooding. Tillage of the soil when it is too wet results in large clods that become very firm when dry. Soil tilth is often improved by the freeze-thaw action of the soil during the winter. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also improve and help maintain tilth and organic matter content.

This soil is suited to grasses and water-tolerant legumes for hay or pasture even though it is generally not adequately drained. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged wetness. The wetness of this soil also precludes the use of most legumes. The clayey nature of the subsoil restricts the use of subsurface drains. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition equipment limitations, seedling mortality, and windthrow hazard are concerns in management. Seasonal wetness and frequent flooding hinder harvesting and logging operations and also the planting of seedlings. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites and is generally not used for this purpose because of wetness, shrinking and swelling, and frequent flooding. An alternate site should be considered. This soil is severely limited for local roads because of wetness, low strength, and frequent flooding. Drainage ditches are needed along roads and streets to lower the water table and the excess water. The upper layer of the soil should be replaced or strengthened with a more suitable base material. The limitations for septic tank absorption fields are also severe because of wetness and flooding and the slow or very slow permeability. It would be better to select an alternate site.

This soil is in capability subclass IIIw and woodland suitability subclass 2w.

Zs—Zipp Variant silt loam. This nearly level, deep, somewhat poorly drained soil is on broad flats and depressions on bottom land. It is subject to frequent flooding from January to May for brief periods. Areas are generally broad and irregular in shape. They range from 3 to 150 acres and have a dominant size of about 40 acres.

In a typical profile the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 60 inches thick. It is brown, mottled, firm silty clay loam in the upper part; grayish brown, mottled, firm silty clay in the middle part; and gray, mottled, firm stratified silty clay and clay in the lower part. The substratum to a depth of 80 inches is light brownish gray, mottled stratified silt loam and silt.

Included with this soil in mapping are a few small areas of somewhat poorly drained Stendal and Whitaker soils and a few small depressional areas of poorly drained Bonnie and Peoga soils and the very poorly drained, frequently flooded Zipp soils. Stendal and Whitaker soils have less clay throughout than the Zipp Variant soil. Inclusions make up about 10 to 15 percent of the unit.

The available water capacity of this Zipp Variant is moderate, and permeability is slow. Surface runoff from cultivated areas is slow. The organic matter content of the surface layer is low. The surface layer can be tilled only throughout a narrow range in moisture content. This soil has a seasonal high water table at a depth of 1 to 3 feet from January to April.

Many areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland.

This soil is suited to corn and soybeans. Small grain is subject to severe damage during periods of prolonged flooding. Wetness and flooding are the main concerns in use and management. This soil needs adequate drainage for maximum crop production. Excess water can be removed by open ditches and surface drains. The clayey nature of the subsoil restricts the use of subsurface drains. This soil is suited to intensive row cropping if it has drainage and proper management. Frost and water damage can be reduced with the use of short-season varieties of adapted crops. Conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops improve and help maintain tilth and organic matter content. Tillage of the soil when it is too wet results in large clods that become very firm when dry. Soil tilth is often improved by the freeze-thaw action of the soil during the winter.

This soil is poorly suited to grasses and water-tolerant legumes for hay or pasture because it is generally not adequately drained and is subject to frequent flooding. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged wetness. The wetness of this soil also precludes its use for most legumes. Major concerns of management are overgrazing and grazing when the soil is too wet. Overgrazing will reduce the density and hardiness of plants. This also causes surface compaction and poor tilth. Restricted use during wet periods as well as proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, seedling mortality, and windthrow hazard are concerns in management. Seasonal wetness and flooding hinder harvesting and logging operations and also the planting of seedlings. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include exclusion of livestock, harvesting mature trees, and saving desired seed trees. Generally, this soil is not suited to black walnut plantings.

This soil is severely limited for building sites and is generally not used for this purpose because of wetness, frequent flooding, and shrinking and swelling. It would be better to select an alternate site. It is severely limited for local roads and streets because of shrinking and swelling, frequent flooding, and low strength. The upper layer of the soil should be replaced or strengthened with a more suitable base material. Limitations for septic tank absorption fields are also severe because of wetness, frequent flooding, and slow permeability.

This soil is in capability subclass IIw and woodland suitability subclass 2c.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Jesse Wilcox, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 85,962 acres in the survey area was used for crops and pasture in 1967, according to the Conservation Needs Inventory. Of this total 36,146 acres was used for permanent pasture; 10,855 acres for row crops, mainly corn and soybeans; 1,566 acres for close-grown crops, mainly wheat and oats; 19,934 acres for rotation hay and pasture; the rest was idle cropland and used for conservation purposes (*3*).

The potential of the soils in Monroe County is fair for increased production of food. About 11,662 acres of potentially good cropland is currently used as woodland and about 11,547 acres as pasture. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

The acreage in crops and pasture has gradually decreased as more and more land is used for urban development. In 1967 there were about 38,508 acres of urban and built-up land in the county; this figure has been growing. The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section "General soil map units."

Soil drainage is the major management need on about 17 percent of the cropland and pasture in the county. Some soils are so wet that the production of crops common to the area is generally not possible. These are the poorly drained and very poorly drained Bonnie, Peoga, and Zipp frequently flooded soils. These soils receive runoff from adjacent uplands. A few areas are in depressions, and drainage ditches that lead to a suitable outlet, if one exists, would have to be deepened and extended for great distances.

Unless they are artificially drained, the somewhat poorly drained soils are so wet that crops are damaged during most years. In this category are the Bartle, Iva, Stendal, Wakeland, Whitaker, and Zipp Variant soils.

Bedford, Caneyville, Crider, Hagerstown, Hosmer, Pekin, Tilsit, and Zanesville soils have good natural

drainage most of the year, but they tend to dry slowly after rains. Small areas of wetter soils that are along drainageways and in swales are included in areas of the well drained and moderately well drained Alford, Burnside, Chetwynd, Crider, Cuba, Elkinsville, Hagerstown, Haymond, Martinsville, Parke, Princeton, Ryker, Steff, Stonelick, and Wilbur soils, especially those that have slopes of 2 to 6 percent. Artificial drainage is needed in some of these wetter areas.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed in most areas of the poorly drained and very poorly drained soils used for intensive row cropping. Drains have to be more closely spaced in soils with slow permeability than in soils that are more permeable. Tile drainage is very slow in Peoga, Zipp, and Zipp frequently flooded soils. Finding adequate outlets for tile drainage systems is difficult in some areas of Bonnie, Peoga, Zipp, Zipp frequently flooded, and Zipp Variant soils.

Soil erosion is the major problem on about 72 percent of the cropland and pasture in Monroe County. If the slope is more than 2 percent, erosion is a hazard. Tilsit soils, for example, have slopes of 2 to 6 percent and have an additional problem of wetness.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as the Caneyville, Ebal, Hagerstown, and Zipp Variant soils, and on soils with a layer in or below the subsoil that limits the depth of the root zone. Such layers include a fragipan, as in Bartle, Bedford, Hosmer, Pekin, Tilsit, and Zanesville soils, or bedrock, as in Berks, Burnside, Caneyville, Caneyville Variant, Corydon Variant, Gilpin, and Weikert soils. Erosion also reduces productivity on soils that tend to be droughty, such as Princeton soils. Second, soil erosion results in sediment entering streams. Control of erosion minimizes the pollution of streams by sediment and improves quality of the water for municipal use, for recreation, and for fish and wildlife.

In many sloping fields, preparing a good seedbed and tilling are difficult on clayey or hardpan spots because the original friable surface soil has been eroded away. Such spots are common in areas of Caneyville, Crider, and Hagerstown soils.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system in which vegetation covers the soil for extended periods can keep the amount of soil lost through erosion low enough that it will not reduce the productive capacity of the soil. On livestock farms, which require pasture and hay, the legume and grass forage in the cropping system reduces erosion on sloping land and also provides nitrogen and improves tilth for the following crop.

Slopes are so short and irregular that contour tillage or terracing is not practical in most areas of the sloping Caneyville, Caneyville Variant, Chetwynd, Gilpin, Hagerstown, Princeton, and Ryker soils. On these soils, cropping systems that provide substantial vegetative cover are required to control erosion unless conservation tillage is practiced. Minimizing tillage and leaving crop residue on the surface can increase infiltration and reduce runoff and the hazard of erosion. These practices can be adapted to most soils in the survey area, but are more difficult to use successfully on the severely eroded Gilpin and Hagerstown soils that have a high clay content in their surface layer.

Conservation tillage is a technique which leaves a cover of crop residue to reduce wind erosion and runoff. It utilizes a chisel plow or a disc as the primary tillage tool instead of the conventional moldboard plow. Conservation tillage results in better erosion control, moisture conservation, and more timely planting. It also reduces the labor, fuel, and equipment costs. Deep tillage cuts more than 6 inches into the soil and combines most of the residue into the soil. It is generally accomplished by use of a chisel plow, deep-V chisel, heavy primary disc, or rotary tiller. Shallow full-width tillage cuts 3 to 6 inches deep into the soil and incorporates only a part of the residue. Generally, a tandem disc, harrow, field cultivator, or rotary tiller is used. Narrow strip tillage is what is generally called no-till, slot plant, or colter plant; the previous crop is chopped and left on the surface. At planting, a 1- to 2-inch-wide strip is prepared for the row. Because almost all residue remains on the surface, cover may vary from 60 to 90 percent, depending on the amount of residue left from the previous crop, method of harvest, and width of tilled strip. No-till, which is commonly used for corn on an increasing acreage, is effective in reducing erosion on sloping land and can be adapted to most well drained and moderately well drained soils. It is less successful, however, on soils with a clayey surface layer.

Diversions and parallel tile outlet terraces are used to shorten the effective length of slope and are effective in reducing sheet, rill, and gully erosion. They are most practical on deep, well drained soils that are highly susceptible to erosion. Alford soils and some Crider, Hosmer, and Wellston soils are suitable for terraces. The other soils are less suitable for terraces and diversions because of irregular slopes, excessive wetness in the terrace channels, a clayey subsoil which would be exposed in terrace channels, or bedrock at a depth of less than 40 inches. Terracing reduces soil loss and the associated loss of fertilizer elements; reduces sedimentation which damages crops and drainageways; and, by eliminating the need for grassed waterways, makes more of the productive land available for row crops and reduces the amount of pesticides entering watercourses. Terracing also makes it easier to farm on the contour, which, in turn, reduces the amount of fuel needed.

Grassed waterways are needed in many areas of Monroe County on sloping soils such as Crider and

Hagerstown soils. Waterways are also needed in many areas of Bedford and Hosmer soils where a large watershed drains across them. Tile drainage is generally needed below waterways because the soils are seepy.

Contouring and contour stripcropping are sometimes used in controlling erosion in the survey area. They are best adapted to soils with smooth, uniform slopes, including most areas of the sloping Bartle, Bedford, Crider, Elkinsville, Hagerstown, Hosmer, Martinsville, Parke, Pekin, Princeton, Tilsit, and Zanesville soils.

Wind erosion is a hazard on the sandy Princeton soils. It can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining vegetative cover, surface mulch, or rough surfaces through proper tillage minimizes wind erosion. Windbreaks of adapted shrubs are effective in reducing wind erosion. Also, soils that are plowed in the fall are very susceptible to wind erosion the following spring.

Information on the design or erosion control practices for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil fertility is naturally low in most soils of the uplands and on terraces in the survey area. All except the Haymond, Stonelick, Wakeland, Wilbur, and Zipp soils are naturally acid. These soils are on flood plains and range from slightly acid to mildly alkaline, and they are naturally higher in plant nutrients than most soils on uplands and terraces.

Most soils on uplands and terraces are naturally medium acid to very strongly acid. They generally require applications of ground limestone to raise the pH level sufficiently for good growth of alfalfa and other crops that grow well only on nearly neutral soils. Available phosphorus and potash levels are naturally low in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. All crops respond well to lime and fertilizer applied according to soil tests and plant needs. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Tilth is an important factor in the germination of seeds and in the infiltration of water. Soils with good tilth are granular and porous.

Many of the soils used for crops in the survey area have a silt loam surface that is light in color and low in content of organic matter. Generally, the structure of such soils is moderate to weak, and intense rainfall causes the formation of some crust on the surface. The crust in some areas is hard when it is dry and is impervious to water. Once a crust forms, infiltration is reduced and runoff is increased. Regular additions of crop residue, manure, and other organic material can help improve soil structure and reduce crust formation.

Fall plowing is generally not a good practice on the light colored soils that have a silt loam surface layer because a crust forms during the winter and spring. Many of the soils are nearly as dense and hard at planting time as they were before fall plowing. Also, about 72 percent of the cropland consists of sloping soils that are subject to damaging erosion if they are plowed in the fall.

The light colored Zipp, Zipp frequently flooded, and Zipp Variant soils are clayey, and because they often stay wet until late in spring, tilth is a problem. If plowed when wet, these soils tend to be very cloddy when dry, and good seedbeds are difficult to prepare. Fall plowing generally results in good tilth in the spring.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Corn and soybeans are the main row crops.

Wheat and oats are the common close-growing crops. Rye and barley could be grown, and grass and legume seed could be produced from alfalfa, bluegrass, fescue, lespedeza, orchardgrass, red clover, sudangrass, and timothy.

Specialty crops are of limited commercial importance in the survey area. Only a small acreage is used for grapes, potatoes, and small fruits. Deep soils that have good natural drainage and that warm early in spring are especially well suited to many specialty crops. These include Crider, Martinsville, and Princeton soils that have slopes of less than 12 percent. Princeton soils need irrigation for optimum production. Crops can generally be planted and harvested earlier on all these soils than on other soils.

Most of the well drained soils are suitable for orchards and nursery plants. Soils in low positions on the landscape where frost is frequent and air drainage is poor, generally are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant.

diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Mitchell G. Hassler, forester, Soil Conservation Service, helped prepare this section.

Hardwood forest originally covered most of Monroe County. In 1967 about 110,000 acres was woodland. Much of the present forest cover is on strongly sloping to very steep upland soils and on nearly level, somewhat poorly drained to very poorly drained, terrace and bottom land soils.

The soils vary widely in their suitability for trees. Productivity is affected by such things as available water capacity, depth of the rooting zone, thickness of the surface layer, texture, consistence, aeration, natural fertility, and depth to the water table.

Upland oak, tulip poplar, black walnut, and pin oak are the principal woodland crops in Monroe County. Upland oaks are dominant on the well drained upland soils. Tulip poplar generally grows on the lower parts of steep slopes, on cool aspects (north and northeast slopes), and in coves. Black walnut is sensitive to soil conditions. It grows best on deep, well drained, nearly neutral soils which are moist and fertile. It favors sites that are along narrow streams and on the north and northeast slopes, and it grows in coves. Pin oak grows on poorly drained and very poorly drained soils on uplands, terraces, and bottom land.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for

each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey; for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Lake Lemon, a popular recreation area in the eastern part of the county, was completed in 1952. Monroe Reservoir, the largest body of water in Indiana, was completed in 1964 and is located eight miles southeast of Bloomington. Monroe Reservoir is approximately 30 miles long. It is operated for the combined purposes of flood control, low-flow regulation, water supply, and recreation. Floodwaters are impounded as necessary, regardless of season; when the danger of downstream flooding has passed, the water is released and the pool returned to its proper level. Recreational uses for the lake include boating, fishing, picnicking, swimming, camping, and waterfowl hunting (fig. 3).

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, sorghum and sunflowers.

Grasses and legumes are domestic perennial grasses

Figure 3.—This boat dock on Lake Monroe is on Pekin silt loam, 2 to 6 percent slopes.

and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are timothy, orchardgrass, switchgrass, clover, and lespedeza.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, bristlegrass, panic grass, beggarweed, pokeweed, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, wild cherry, beech, maple, dogwood, hickory, blackberry, and wild grape. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive, shrub dogwood, crabapple, Washington hawthorn, and bush-honeysuckle.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, pondweed, wild millet, algae, cordweed, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are

created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shorebirds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer;

stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of

organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by

intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent.

Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic

matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sols*. An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that have a Udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaudalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*7*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*9*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alford series

The Alford series consists of deep, well drained, moderately permeable soils. They formed in loess on uplands. Slopes range from 2 to 6 percent. These soils have a lower base status and are lower in reaction than is defined in the range for the Alford series. This difference does not alter the use or behavior of the soil.

Alford soils are commonly adjacent to Crider, Hosmer, Iva, and Ryker soils. Crider and Ryker soils have more clay in the lower part of the solum than Alford soils. Crider soils have less than 40 inches of loess, and Ryker soils have till within a depth of 3 feet of the surface. Hosmer soils have a fragipan and are in the broader

areas. Iva soils have mottles of low chroma in the subsoil and are in depressional areas.

Typical pedon of Alford silt loam, 2 to 6 percent slopes, in a cultivated field; 1,100 feet west and 1,600 feet south of the northeast corner of sec. 12, T. 10 N., R. 2 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

B1—9 to 14 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; common fine roots; slightly acid; clear wavy boundary.

B21t—14 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin continuous strong brown (7.5YR 5/6) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—21 to 27 inches; yellowish brown (10YR 5/6) silty clay loam; strong medium and coarse subangular blocky structure; firm; few fine roots; thick continuous brown (7.5YR 5/4) clay films on faces of peds; extremely acid; clear wavy boundary.

B23t—27 to 38 inches; yellowish brown (10YR 5/6) silty clay loam; strong coarse subangular blocky structure; firm; few fine roots; thick continuous brown (7.5YR 5/4) clay films on faces of peds; extremely acid; clear wavy boundary.

IIB31—38 to 50 inches; yellowish brown (10YR 5/6) silt loam; few medium distinct light yellowish brown (10YR 6/4) mottles; weak fine subangular blocky structure; friable; extremely acid; clear wavy boundary.

IIB32—50 to 57 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/4) mottles; weak medium subangular blocky structure; friable; common fine iron and manganese oxide accumulations; extremely acid; clear wavy boundary.

IIC—57 to 70 inches; yellowish red (5YR 5/6) silt loam; massive; friable; many fine and medium iron and manganese oxide accumulations; extremely acid.

The thickness of the solum ranges from about 40 to 60 inches. The thickness of the loess ranges from 5 to 10 feet.

The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam that has clay content of 20 to 30 percent. The B2t horizon is medium acid to extremely acid. The IIB3 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. The IIC horizon has hue of 7.5YR or 5YR, value of 5, and chroma 4 to 6. It has 5 to 15 percent less clay than the B2t horizon.

Bartle series

The Bartle series consists of somewhat poorly drained soils on broad terraces. These soils are moderately deep to a fragipan. They are moderately permeable above the fragipan and very slowly permeable within the fragipan. They formed in alluvium derived from mixed origin. Slopes range from 0 to 3 percent.

Bartle soils are commonly adjacent to Elkinsville, Pekin, and Peoga soils. Elkinsville and Pekin soils do not have mottles of low chroma in the upper 10 inches of the argillic horizon and are in steeper areas than Bartle soils. Peoga soils have lower chroma in the surface layer and are in depressions.

Typical pedon of Bartle silt loam, in a cultivated field; 360 feet north and 2,200 feet east of the southwest corner of sec. 11, T. 10 N., R. 2 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B21t—9 to 14 inches; pale brown (10YR 6/3) silt loam; many medium distinct strong brown (7.5YR 5/6) and many medium faint light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; many fine roots; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; clear wavy boundary.

B22tg—14 to 21 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct strong brown (7.5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; friable; common fine roots; thin discontinuous strong brown (7.5YR 5/6) and light brown (7.5YR 6/4) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide concretions; extremely acid; clear wavy boundary.

B23tg—21 to 29 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; friable; common fine roots; thin discontinuous light brown (7.5YR 6/4) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide concretions; extremely acid; clear wavy boundary.

Bx1g—29 to 42 inches; light brownish gray (10YR 6/2) silt loam; many coarse distinct strong brown (7.5YR 5/6) mottles; strong very coarse prismatic structure; very firm and brittle; many fine and medium black (10YR 2/1) iron and manganese oxide concretions; extremely acid; clear wavy boundary.

Bx2g—42 to 47 inches; gray (10YR 6/1) silt loam; many coarse distinct strong brown (7.5YR 5/6) mottles; strong very coarse prismatic structure; very firm and brittle; common fine black (10YR 2/1) iron and

manganese oxide accumulations; extremely acid; clear wavy boundary.

C1g—47 to 54 inches; gray (N 6/0) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; medium acid; clear wavy boundary.

C2g—54 to 60 inches; gray (N 5/0) silt loam; many coarse distinct yellowish red (5YR 5/6) mottles; massive; firm; medium acid.

The thickness of the solum ranges from 40 to 60 inches. Depth to the fragipan ranges from 24 to 36 inches, and it is 18 to 37 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The upper part of the B2t horizon has hue of 10YR or 2.5Y, value of 6, and chroma of 3 or 4 and the lower part has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. The B2t horizon is silt loam or silty clay loam that has a clay content of 20 to 30 percent. It is strongly acid to extremely acid. The Bx horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 1 to 6 and has distinct mottles. The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 1 or 2 or has hue of N and value of 5 or 6. It is stratified with thick layers of silty clay loam and silt loam.

Bedford series

The Bedford series consists of moderately well drained soils that are moderately deep to a fragipan. They are on loess-covered uplands. They are moderately permeable above the fragipan and very slowly permeable within the fragipan. They formed in loess and the underlying residuum from limestone. Slopes range from 2 to 6 percent.

Bedford soils are similar to Hosmer and Tilsit soils and are commonly adjacent to Crider and Iva soils. Hosmer soils are generally formed in more than 4 feet of silty loess. Tilsit soils are formed over sandstone, siltstone, or shale. Crider and Iva soils do not have a fragipan. Crider soils have steeper slopes. Iva soils have low-chroma mottles in the upper 20 inches and are in depressional areas.

Typical pedon of Bedford silt loam, 2 to 6 percent slopes, in a cultivated field; 1,360 feet north and 440 feet west of the southeast corner of sec. 18, T. 8 N., R. 1 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B1—7 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; neutral; clear wavy boundary.

B31t—12 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 5/3) clay films on faces of peds; strongly acid; clear wavy boundary.

Bx1—20 to 27 inches; mottled strong brown (7.5YR 5/6) and brown (7.5YR 4/4) silty clay loam; moderate very coarse prismatic structure; firm; common discontinuous distinct thin brown (10YR 5/3) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) and pale brown (10YR 6/3) silt flows between faces of peds; extremely acid; clear wavy boundary.

Bx2—27 to 48 inches; strong brown (7.5YR 5/6) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; strong very coarse prismatic structure; very firm and brittle; thick continuous grayish brown (10YR 5/2) and brown (7.5YR 5/4) clay films on faces of prisms; many continuous distinct thick light brownish gray (10YR 6/2) silt flows between faces of prisms; extremely acid; clear wavy boundary.

IIB22t—48 to 60 inches; strong brown (7.5YR 5/6), brown (7.5YR 5/4), red (10R 5/6), light brownish gray (10YR 6/2), and grayish brown (10YR 5/2) silty clay loam; strong medium subangular blocky structure; firm; grayish brown (10YR 5/2) and brown (7.5YR 5/4) clay films on faces of peds; 10 percent chert fragments; extremely acid; clear wavy boundary.

IIB23t—60 to 80 inches; strong brown (7.5YR 5/6) silty clay; common medium distinct red (10R 4/6) mottles; weak coarse subangular blocky structure; firm; thick continuous grayish brown (10YR 5/2) and brown (7.5YR 5/4) clay films on faces of peds; 5 percent chert fragments; very strongly acid.

The thickness of the solum ranges from 48 to 96 inches. Depth to the fragipan ranges from 20 to 36 inches, and it is 11 to 34 inches thick. The loess mantle ranges from 20 to 50 inches in thickness.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It ranges from medium acid to neutral. The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. In some pedons low chroma mottles are in the lower part. It is silt loam or silty clay loam with a clay content of 20 to 30 percent. It is strongly acid to extremely acid. The IIB2t horizon is dominantly hue of 7.5YR, 5YR, 2.5YR, and 10R; value of 4 to 6; and chroma of 4 to 6. In some places it has 10YR hue, value of 5 or 6, and chroma of 2 to 6. It is silty clay, clay, or silty clay loam.

Berks series

The Berks series consists of moderately deep, well drained soils. They are moderately or moderately rapidly permeable. They formed in sandstone, siltstone, and shale residuum on uplands. Slope ranges from 25 to 45 percent.

Berks soils are similar to Gilpin and Wellston soils and are commonly adjacent to Caneyville, Caneyville Variant, Corydon Variant, and Weikert soils. Caneyville,

Caneyville Variant, Corydon Variant, Gilpin, and Wellston soils have an argillic horizon. Caneyville and Caneyville Variant soils also have limestone bedrock within 20 inches of the surface. Weikert soils have sandstone, siltstone, or shale bedrock within 20 inches of the surface.

Typical pedon of Berks silt loam from an area of Berks-Weikert complex, 25 to 75 percent slopes, in a woods; 2,280 feet south and 550 feet east of the northwest corner of sec. 19, T. 8 N., R. 1 E.

A1—0 to 4 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine and medium roots; 10 percent sandstone fragments; neutral; abrupt smooth boundary.

B21t—4 to 9 inches; yellowish brown (10YR 5/4) channery silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; many fine and medium roots; 15 percent sandstone fragments; strongly acid; clear wavy boundary.

B22—9 to 22 inches; brown (7.5YR 5/4) very channery silt loam; common medium distinct yellowish brown (10YR 5/8) and pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; friable; few fine and medium roots; 50 percent sandstone fragments; strongly acid; clear wavy boundary.

C—22 to 38 inches; strong brown (7.5YR 5/6) very channery silt loam; massive; friable; 80 percent sandstone fragments; strongly acid; abrupt wavy boundary.

Cr—38 inches; strong brown (7.5YR 5/6) very channery silt loam; soil material is within bedding planes and cracks or fissures; 80 percent hard sandstone.

Thickness of the solum ranges from 18 to 36 inches, and depth to bedrock ranges from 20 to 40 inches. Coarse fragments of sandstone, siltstone, or shale occur throughout the profile. Unless limed, the lower part of the solum is strongly acid or very strongly acid, and the C horizon is very strongly acid to medium acid.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is 0 to 50 percent coarse fragments and is silt loam, channery silt loam, or very channery silt loam. The B2 horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8. It is 15 to 50 percent coarse fragments. The C horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 to 8. It is 60 to 80 percent coarse fragments and is very channery or very flaggy silt loam.

Bonnie series

The Bonnie series consists of deep, poorly drained, moderately slowly permeable soils. They formed in acid silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Bonnie soils are similar to Stendal and Wakeland soils and are commonly adjacent to Burnside, Steff, and Zipp frequently flooded soils. Stendal and Wakeland soils are dominantly gray between the Ap horizon and a depth of 30 inches and are on higher lying positions than Bonnie soils. Wakeland soils are also less acid. Burnside soils contain more than 35 percent coarse fragments throughout the profile and are on the upper end of drainageways. Steff soils have mottles of low chroma within a depth of 24 inches and are on the higher positions. Zipp frequently flooded soils have more clay in the control section.

Typical pedon of Bonnie silt loam, in a cultivated field; 1,480 feet south and 1,520 feet east of the northwest corner of sec. 9, T. 9 N., R. 1 W.

Ap—0 to 6 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/4) dry; common fine and medium distinct gray (10YR 6/1), yellowish red (5YR 4/8), and yellowish brown (10YR 5/8) mottles; moderate medium granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

C1g—6 to 14 inches; light brownish gray (10YR 6/2) silt loam; many medium and coarse distinct yellowish red (5YR 4/6) and common medium faint brown (10YR 5/3) mottles; moderate medium and coarse subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.

C2g—14 to 24 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct brownish yellow (10YR 6/6) and yellowish brown (10YR 5/4) mottles; massive; friable; few fine roots; strongly acid; clear wavy boundary.

C3g—24 to 28 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/6), light yellowish brown (10YR 6/4), and strong brown (7.5YR 5/6) mottles; massive; friable; few fine roots; many black (10YR 2/1) iron stains on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

C4g—28 to 54 inches; mottled light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and light yellowish brown (10YR 6/4) silt loam; massive; friable; very strongly acid; gradual wavy boundary.

C5g—54 to 60 inches; mottled light brownish gray (10YR 6/2), yellowish red (5YR 5/8), and dark red (10R 3/6) silt loam; massive; friable; very strongly acid; gradual wavy boundary.

The Ap horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 or 6; and chroma of 1 to 3 and has distinct mottles. The 10-to 40-inch control section averages between 18 and 27 percent clay and less than 15 percent fine sand. The C horizon dominantly has hue of 10YR, value of 5 or 6, and chroma of 2 to 6, but some subhorizons have hue of 7.5YR, 5YR, or 10R; value of 3 to 6; and chroma of 4 to 8.

Burnside series

The Burnside series consists of deep, well drained, moderately permeable soils. They formed in channery alluvium on flood plains. Slopes range from 0 to 2 percent.

Burnside soils are similar to Cuba and Haymond soils and are commonly adjacent to Berks, Gilpin, and Weikert soils. Cuba and Haymond soils contain less than 35 percent coarse fragments in the upper part of the solum. Cuba soils have more clay than Burnside soils. Haymond soils also have less than 15 percent sand coarser than very fine. Berks, Gilpin, and Weikert soils have steeper slopes. Berks soils have an argillic horizon. Weikert soils have a lithic contact within a depth of 20 inches.

Typical pedon of Burnside silt loam, in a cultivated field; 160 feet west and 20 feet south of the northeast corner of sec. 17, T. 7 N., R. 1 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; 5 percent sandstone fragments; medium acid; abrupt smooth boundary.

B1—9 to 20 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; 5 percent sandstone fragments; strongly acid; clear wavy boundary.

IIB21—20 to 26 inches; yellowish brown (10YR 5/4) channery silt loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; 25 percent sandstone fragments; strongly acid; clear wavy boundary.

IIB22—26 to 34 inches; yellowish brown (10YR 5/4) very channery silt loam; weak fine subangular blocky structure; friable; 50 percent sandstone fragments; strongly acid; clear wavy boundary.

IIC—34 to 44 inches; dark yellowish brown (10YR 4/4) very channery silt loam; massive; friable; 80 percent sandstone fragments; strongly acid; abrupt smooth boundary.

R—44 inches; sandstone bedrock.

Thickness of the solum ranges from 16 to 40 inches, and depth to bedrock ranges from 40 to 54 inches. Coarse fragments range from 2 to 35 percent in the upper part of the solum and 35 to 80 percent in the lower part. The coarse fragments mainly consist of thin, flat fragments of sandstone which increase in size and abundance with depth. They range from 3 millimeters to over 15 inches in length and from 3 millimeters to 3 inches thick.

The Ap horizon and B1 horizon have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. In uncultivated areas, the A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A horizon and B1 horizon are silt loam, loam, channery silt loam, or channery loam. The IIB horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is a channery, very channery, flaggy, or very flaggy analog of silt loam or loam that has 20 to 80 percent coarse fragments. It is strongly acid or very strongly acid. The C horizon is a channery, very channery, flaggy, or very flaggy analog of silt loam, loam, or sandy loam that has 35 to 90 percent coarse fragments. It is strongly acid or very strongly acid.

Caneyville series

The Caneyville series consists of moderately deep, well drained soils. They are moderately slowly permeable. They formed in limestone residuum on uplands. Slopes range from 7 to 25 percent.

Caneyville soils are similar to Caneyville Variant and Hagerstown soils and are commonly adjacent to Crider soils. Caneyville Variant soils have more than 35 percent coarse fragments throughout and are steeper than Caneyville soils. Crider and Hagerstown soils are more than 40 inches deep to limestone bedrock. Crider soils also contain more silt and less clay.

Typical pedon of Caneyville silt loam, 12 to 18 percent slopes, in a cultivated field; 2,200 feet north and 1,000 feet east of the southwest corner of sec. 1, T. 7 N., R. 2 W.

Ap1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 4/3) dry; common medium faint dark grayish brown (10YR 4/2) mottles; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Ap2—3 to 5 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium platy structure; friable; many fine roots; slightly acid; abrupt wavy boundary.

B1—5 to 8 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; many fine roots; thin discontinuous dark brown (10YR 4/3) silt coatings on faces of peds; strongly acid; abrupt wavy boundary.

B21t—8 to 11 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; many fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; abrupt wavy boundary.

B22t—11 to 24 inches; strong brown (7.5YR 5/6) silty clay loam; weak coarse subangular blocky structure parting to strong medium subangular blocky; friable; common fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; few black (10YR 2/1) organic fillings in root channels; very strongly acid; clear wavy boundary.

B23t—24 to 34 inches; yellowish red (5YR 5/6) silty clay; strong coarse subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B24t—34 to 35 inches; brown (7.5YR 5/4) silty clay; strong coarse subangular blocky structure; firm;

many continuous dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; abrupt broken boundary.

R—35 inches; limestone bedrock.

Thickness of the solum and depth to bedrock range from 20 to 40 inches. Coarse fragments of limestone, chert, or sandstone range from 0 to 10 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. In uncultivated areas the A1 horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. The B1 horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 to 6. It is silt loam or silty clay loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 to 8. It is silty clay loam, silty clay, or clay and is very strongly acid to medium acid. Some pedons have a B3 or C horizon that is slightly acid to neutral.

Caneyville Variant

The Caneyville Variant consists of moderately deep, well drained soils. They are slowly permeable. They formed in limestone residuum on uplands. Slopes range from 25 to 70 percent.

Caneyville Variant soils are similar to Caneyville and Hagerstown soils and are commonly adjacent to Corydon Variant and Crider soils. Caneyville, Crider, and Hagerstown soils have less than 35 percent coarse fragments throughout and are in less sloping areas than Caneyville Variant soils. Corydon Variant soils have limestone bedrock within 13 to 20 inches of the surface. Crider soils also have more silt and less clay.

Typical pedon of Caneyville channery silt loam from an area of Corydon Variant-Caneyville Variant complex, 25 to 70 percent slopes, in a cultivated field; 1,640 feet north and 1,440 feet west of the southeast corner of sec. 5, T. 7 N., R. 1 W.

Ap—0 to 3 inches; dark brown (10YR 3/3) channery silt loam, brown (10YR 4/3) dry; moderate medium granular structure; friable; many fine roots; 15 percent rock fragments; neutral; abrupt smooth boundary.

B1—3 to 13 inches; yellowish brown (10YR 5/6) channery silt loam; moderate medium subangular blocky structure; common fine roots; 15 percent rock fragments; strongly acid; clear wavy boundary.

B21t—13 to 22 inches; reddish brown (5YR 4/3) silty clay; moderate medium subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; 5 percent chert fragments; strongly acid; abrupt wavy boundary.

B22t—22 to 30 inches; reddish brown (5YR 4/4) flaggy clay; moderate medium subangular blocky structure; firm; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; 40 percent fragments; slight effervescence; mildly alkaline; abrupt broken boundary.

R—30 inches; limestone bedrock.

Thickness of the solum and depth to bedrock range from 20 to 40 inches. Coarse fragments of limestone, chert, or sandstone increase in size and abundance with depth.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or a channery or cherty analog of this texture. It is 5 to 30 percent coarse fragments. In uncultivated areas the A1 horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3 and is 1 to 5 inches thick. The B1 horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 to 6. The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 to 8. It is silty clay loam, silty clay, or clay or a channery, very channery, cherty, very cherty, flaggy, or very flaggy analog of these textues. The B2t horizon is 5 to 50 percent coarse fragments. It is very strongly acid to medium acid. A B3 horizon or C horizon is in some pedons, and it is slightly acid to mildly alkaline.

Chetwynd series

The Chetwynd series consists of deep, well drained soils on side slopes of glacial outwash plains and terraces. These soils are moderately permeable. They formed in a thin mantle of loess and the underlying highly weathered glacial outwash. Slopes range from 12 to 70 percent.

Chetwynd soils are similar to Parke soils and are commonly adjacent to Hickory, Pekin, and Ryker soils. Parke soils have a mantle of loess thicker than 20 inches. Hickory soils are shallower to free carbonates and are not as red as Chetwynd soils. Pekin soils have a fragipan. Ryker soils are higher in clay in the lower part of the solum and have a higher base saturation. Pekin and Ryker soils are in less sloping areas on the landscape.

Typical pedon of Chetwynd silt loam, 25 to 70 percent slopes, in a wooded area; 850 feet east and 1,430 feet south of the northwest corner of sec. 11, T. 10 N., R. 2 W.

A1—0 to 3 inches; dark brown (10YR 4/3) silt loam; light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; 3 percent fine gravel; slightly acid; abrupt wavy boundary.

A2—3 to 6 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; many fine roots; medium acid; abrupt wavy boundary.

B1—6 to 11 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; friable; common fine roots; medium acid; clear wavy boundary.

IIB21t—11 to 15 inches; yellowish red (5YR 5/6) clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous yellowish red (5YR 4/6) clay films on faces of peds; strongly acid; clear wavy boundary.
IIB22t—15 to 30 inches; yellowish red (5YR 5/6) clay loam; weak coarse subangular blocky structure; friable; few fine roots; medium continuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; abrupt wavy boundary.
IIB23t—30 to 38 inches; mottled strong brown (7.5YR 5/6) and red (2.5YR 4/6) sandy clay loam; weak medium and coarse subangular blocky structure; friable; common fine black (10YR 2/1) iron and manganese oxide accumulations; 10 percent fine gravel; strongly acid; abrupt wavy boundary.
IIB24t—38 to 55 inches; yellowish red (5YR 4/8) and strong brown (7.5YR 5/8) sandy clay loam; massive; friable; few fine black (10YR 2/1) iron and manganese oxide accumulations; 10 percent fine gravel; strongly acid; abrupt wavy boundary.
IIB25t—55 to 80 inches; yellowish red (5YR 4/8) and strong brown (7.5YR 5/8) sandy clay loam; massive; friable; common fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid.

Thickness of the solum and depth to free carbonates range from 80 to 125 inches. The loess mantle is less than 18 inches thick. Fine gravel in the solum ranges from 0 to 20 percent.

The A1 horizon and the Ap horizon have hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. The A2 horizon, if there is one, has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The IIB2t horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. It is clay loam, sandy clay loam, or gravelly clay loam. The IIB2t horizon ranges from medium acid to strongly acid.

Corydon Variant

The Corydon Variant consists of shallow, well drained, moderately slowly permeable soils. They formed in residuum from limestone on uplands. Slopes range from 25 to 70 percent.

Corydon Variant soils are similar to Weikert soils and are commonly adjacent to Caneyville, Caneyville Variant, Hagerstown, and Gilpin soils. Gilpin and Weikert soils developed from sandstone, siltstone, or shale residuum. The Caneyville, Caneyville Variant, Hagerstown, and Gilpin soils have a thicker solum and are deeper to the lithic contact.

Typical pedon of Corydon Variant flaggy silt loam from an area of Corydon Variant-Caneyville Variant complex, 25 to 70 percent slopes, in a wooded area; 500 feet south and 660 feet east of the northwest corner of sec. 28, T. 9 N., R. 1 W.

A11—0 to 1 inch; very dark grayish brown (10YR 3/2) flaggy silt loam, brown (10YR 4/3) dry; moderate medium and coarse granular structure; friable; many fine roots; 15 percent limestone fragments; neutral; abrupt smooth boundary.
A12—1 to 8 inches; dark brown (10YR 3/3) flaggy silt loam, brown (10YR 4/3) dry; moderate medium and coarse granular structure; friable; many fine and medium roots; 25 percent limestone fragments; neutral; clear wavy boundary.
B21t—8 to 12 inches; dark brown (10YR 4/3) flaggy silty clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; 35 percent limestone fragments; neutral; clear wavy boundary.
B22t—12 to 16 inches; dark brown (7.5YR 4/4) very flaggy silty clay loam; moderate medium subangular blocky structure; friable; few fine and medium roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; 65 percent limestone fragments; neutral; abrupt irregular boundary.
R—16 inches; limestone bedrock.

Thickness of the solum and depth to limestone bedrock range from 13 to 20 inches.

The A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. It is flaggy or channery silt loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 3 to 6. The upper part is channery or flaggy silt loam, and the lower part is a very channery or very flaggy analog of silty clay loam, silty clay, or clay.

Crider series

The Crider series consists of deep, well drained, moderately permeable soils. They are on loess-covered uplands. They formed in loess deposits and the underlying residuum from limestone. Slopes range from 2 to 18 percent.

Crider soils are commonly adjacent to Alford, Bedford, Hagerstown, and Iva soils. Alford soils formed in more than 5 feet of silty loess. Bedford soils have a fragipan and are in broader areas than Crider soils. Hagerstown soils formed in less than 20 inches of silty loess and the underlying residuum from limestone. Iva soils have mottles of low chroma in the subsoil and are in flat or depressional areas.

Typical pedon of Crider silt loam, 6 to 12 percent slopes, in a cultivated field; 920 feet east and 250 feet north of the southwest corner of sec. 17, T. 8 N., R. 1 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.
B21t—9 to 12 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure;

friable; many fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—12 to 23 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB23t—23 to 28 inches; yellowish red (5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; discontinuous light brown (7.5YR 6/4) silt coatings on faces of peds and in voids; common fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

IIB24t—28 to 33 inches; yellowish red (5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; continuous light yellowish brown (10YR 6/4) silt coatings on faces of peds and in voids; few prominent yellowish red (5YR 4/8) iron and manganese oxide stains; common fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; clear wavy boundary.

IIB25t—33 to 67 inches; red (2.5YR 4/6) clay; strong medium angular blocky structure; firm; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; many fine black (10YR 2/1) iron and manganese oxide concretions; strongly acid; abrupt wavy boundary.

IIR—67 inches; hard limestone bedrock.

Thickness of the solum ranges from 60 to 100 inches. The depth to limestone bedrock ranges from 60 to 140 inches. Thickness of the loess mantle ranges from 20 to 45 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6 in the upper part, and it has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6 in the lower part. It is silt loam or silty clay loam. The IIB2t horizon has hue of 10R, 2.5YR, or 5YR; value of 3 to 5; and chroma of 4 to 8. It is silty clay or clay and is 0 to 20 percent coarse fragments of chert or limestone.

Cuba series

The Cuba series consists of deep, well drained, moderately permeable soils. They formed in acid silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Cuba soils are similar to Steff soils and are commonly adjacent to Burnside, Haymond, and Wakeland soils. Steff soils have mottles of low chroma within a depth of 20 inches and are on lower lying positions than Cuba soils. Burnside soils have more coarse fragments throughout the profile and are on the upper end of drainageways. Haymond soils have less clay in their control section. Haymond and Wakeland soils have a higher base saturation. Wakeland soils are dominantly gray between the Ap horizon and a depth of 30 inches and are in lower lying positions on the landscape.

Typical pedon of Cuba silt loam, in a cultivated field; 200 feet west and 150 feet north of the southeast corner of sec. 4, T. 8 N., R. 1 E.

Ap1—0 to 9 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Ap2—9 to 13 inches; yellowish brown (10YR 5/4) silt loam; common medium faint brown (10YR 5/3) mottles; moderate thin platy structure; friable; few fine roots; neutral; clear wavy boundary.

B2—13 to 28 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium granular structure; friable; few fine black (10YR 2/1) iron and manganese oxide stains on faces of peds; few fine roots; very strongly acid; clear wavy boundary.

C1—28 to 45 inches; mottled yellowish brown (10YR 5/4), pale brown (10YR 6/3), and brownish yellow (10YR 6/6) silt loam; massive; friable; common fine red (2.5YR 4/6) iron and manganese oxide stains on faces of peds; very strongly acid; clear wavy boundary.

C2—45 to 60 inches; yellowish brown (10YR 5/4) stratified loam and silt loam; common medium distinct pale brown (10YR 6/3) and grayish brown (10YR 5/2) mottles; massive; friable; common fine red (2.5YR 4/6) iron and manganese oxide stains on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid.

The thickness of the solum ranges from 20 to 34 inches. Reaction throughout the soil is strongly acid or very strongly acid, unless limed.

The Ap horizon is dark grayish brown (10YR 4/2), dark brown (10YR 4/3), or brown (10YR 5/3). The B2 horizon and C horizon have hue of 10YR, value of 5 or 6, and chroma of 3 to 6. In some pedons the lower part of the C horizon has mottles of low chroma.

Ebal series

The Ebal series consists of deep, moderately well drained soils. They are on uplands. These soils are moderately permeable in the upper part and very slowly permeable in the lower part of the solum. They formed in loess or colluvium and the underlying residuum from interbedded shale and thin layers of sandstone. Slopes range from 12 to 25 percent.

Ebal soils are commonly adjacent to Gilpin and Wellston soils. Gilpin soils do not have a shaly clay subsoil and are 20 to 40 inches deep to sandstone bedrock. Wellston soils have less clay in the subsoil than Ebal soils and are 40 to 72 inches deep to sandstone, siltstone, or shale bedrock.

Typical pedon of Ebal silt loam from an area of Ebal-Wellston-Gilpin silt loams, 12 to 18 percent slopes, in a wooded area; 2,060 feet south and 920 feet east of the northwest corner of sec. 8, T. 7 N., R. 2 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine medium and coarse roots; strongly acid; clear smooth boundary.

B1—3 to 8 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many fine medium and coarse roots; 10 percent sandstone fragments; strongly acid; clear wavy boundary.

IIB21t—8 to 13 inches; yellowish brown (10YR 5/4) channery silty clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; 23 percent sandstone fragments; very strongly acid; clear wavy boundary.

IIB22t—13 to 21 inches; yellowish brown (10YR 5/4) channery silty clay; moderate medium subangular blocky structure; firm; common fine and medium roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; 38 percent sandstone fragments; strongly acid; clear wavy boundary.

IIIB23t—21 to 41 inches; red (2.5YR 4/6) clay; many medium prominent gray (10YR 6/1) mottles; strong medium angular blocky structure; firm; few fine and medium roots; medium discontinuous gray (10YR 6/1) and yellowish brown (10YR 5/6) clay films on faces of peds; very strongly acid; clear wavy boundary.

IIIB24t—41 to 48 inches; yellowish brown (10YR 5/4) clay; many coarse distinct gray (10YR 6/1) and many coarse prominent red (2.5YR 4/6) mottles; moderate medium angular blocky structure; firm; few fine and medium roots; medium discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

IIIB25t—48 to 61 inches; yellowish brown (10YR 5/4) clay; many coarse distinct gray (10YR 6/1) and strong brown (7.5YR 5/8) mottles; strong medium angular blocky structure; firm; few fine and medium roots; medium discontinuous dark gray (10YR 4/1) and brown (10YR 5/3) slickensides on faces of peds; strongly acid; gradual wavy boundary.

IIICr—61 to 80 inches; gray (10YR 6/1) shale; many coarse distinct dark brown (7.5YR 4/4) mottles; strongly acid.

The thickness of the solum and the depth to a paralithic contact range from 50 to more than 80 inches. Depth to hard bedrock ranges from 80 to more than 100 inches. Unless the soil is limed, reaction is medium acid to very strongly acid. Coarse fragments range from 20 to 38 percent in the Bt horizon and IIBt horizon and from 0 to 5 percent in the IIIBt horizon. The thickness of the loess cap ranges from 10 to 30 inches.

The A1 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon, if there is one, has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is channery silt loam or channery silty clay loam and has a clay content of 20 to 30 percent. The IIBt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. The IIIBt horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR; value of 4 to 6; and chroma of 3 to 8 and has distinct mottles. It has a clay content of 55 to 70 percent.

Elkinsville series

The Elkinsville series consists of deep, well drained, moderately permeable soils. They formed in strongly acid silty alluvium on terraces. Slopes range from 2 to 40 percent.

Elkinsville soils are similar to Parke soils and are commonly adjacent to Bartle, Cuba, and Haymond soils. Parke soils are redder than Elkinsville soils and are on uplands. Bartle soils have a fragipan and are on a lower lying position. Cuba and Haymond soils do not have an argillic horizon and are on the surrounding bottom land.

Typical pedon of Elkinsville silt loam, 2 to 6 percent slopes, in a cultivated field; 180 feet south and 1,820 feet west of the northeast corner of sec. 9, T. 10 N., R. 2 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B21t—7 to 14 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; discontinuous light yellowish brown (10YR 6/4) silt coatings on faces of peds; extremely acid; clear wavy boundary.

B22t—14 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; strong medium subangular blocky structure; firm; few fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; discontinuous light yellowish brown (7.5YR 6/4) silt coatings on faces of peds; extremely acid; clear wavy boundary.

B23t—21 to 28 inches; strong brown (7.5YR 5/6) silty clay loam; strong medium subangular blocky structure; firm; thin continuous brown (7.5YR 5/4)

clay films on faces of peds; discontinuous light yellowish brown (10YR 6/4) and pale brown (10YR 6/3) silt coatings on faces of peds; extremely acid; clear wavy boundary.

B24t—28 to 39 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 5/4) clay films on faces of peds; discontinuous light yellowish brown (10YR 6/4) and pale brown (10YR 6/3) silt coatings on faces of peds; extremely acid; clear wavy boundary.

B25t—39 to 60 inches; yellowish brown (10YR 5/6) silt loam; strong coarse subangular blocky structure; friable; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; discontinuous light yellowish brown (10YR 6/4) and pale brown (10YR 6/3) silt coatings on faces of peds; few fine iron and manganese oxide accumulations; extremely acid; clear wavy boundary.

C—60 to 70 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light yellowish brown (10YR 6/4) mottles; massive; firm; discontinuous light yellowish brown (10YR 6/4) silt splotches on faces of peds; few fine iron and manganese oxide stains; very strongly acid.

The thickness of the solum ranges from 40 to 72 inches. Depth to bedrock is greater than 60 inches.

The Ap horizon is dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4), or brown (10YR 5/3). The A2 horizon, if there is one is dark yellowish brown (10YR 4/4) or brown (10YR 5/3). In some pedons there is a B1 horizon. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The upper part of the B2t horizon has a clay content of 20 to 30 percent and the lower part is loam, silt loam, or silty clay loam. The B2t horizon is strongly acid to extremely acid. In some pedons there is a B3 horizon. The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4, 5/6, or 5/8). It is silty clay loam, silt loam, loam, sandy loam, or fine sand and ranges from medium acid to very strongly acid.

Gilpin series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils. They formed in residuum from siltstone, sandstone, and shale on uplands. Slopes range from 12 to 25 percent.

Gilpin soils are similar to Berks and Wellston soils and are commonly adjacent to Corydon Variant and Weikert soils. Berks and Weikert soils do not have an argillic horizon and are steeper than Gilpin soils.

Typical pedon of Gilpin silt loam, 12 to 18 percent slopes, in a cultivated field; 860 feet south and 1,050 feet east of the northwest corner of sec. 31, T. 9 N., R. 1 E.

Ap1—0 to 3 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

Ap2—3 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1—7 to 12 inches; yellowish brown (10YR 5/5) silt loam; moderate medium subangular blocky structure; friable; common fine roots; very strongly acid; clear wavy boundary.

B21t—12 to 20 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; 8 percent sandstone fragments; very strongly acid; clear wavy boundary.

B22t—20 to 28 inches; strong brown (7.5YR 5/6) channery silt loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; 25 percent sandstone fragments; very strongly acid; abrupt wavy boundary.

Cr—28 inches; interbedded sandstone bedrock.

Thickness of the solum ranges from 20 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments of sandstone, siltstone, or shale are in the lower part of the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam or loam. The B2t horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6 to 8. It is loam, silt loam, or silty clay loam or a channery analog of these textures. The B2t horizon has 5 to 40 percent coarse fragments and is strongly acid to extremely acid. Some pedons have a C horizon.

Hagerstown series

The Hagerstown series consists of deep, well drained, moderately permeable soils. These reddish soils formed in loess and the underlying residuum from limestone on uplands. Slopes range from 4 to 35 percent.

Hagerstown soils are similar to Wellston soils and are commonly adjacent to Caneyville and Crider soils. Wellston soils formed in shale, siltstone, or sandstone residuum. Caneyville soils are shallower to bedrock than Hagerstown soils. Crider soils formed in thicker loess deposits and are generally less sloping.

Typical pedon of Hagerstown silt loam, 12 to 18 percent slopes, in a cultivated field; 1,140 feet south and 2,150 feet west of the northeast corner of sec. 6, T. 8 N., R. 1 W.

Ap—0 to 7 inches; brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium

granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21t—7 to 10 inches; dark brown (7.5YR 4/4) silty clay loam; many medium distinct brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; friable; common fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

IIB22t—10 to 21 inches; yellowish red (5YR 4/6) silty clay; strong medium angular blocky structure; firm; few fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide stains; strongly acid; gradual wavy boundary.

IIB23t—21 to 41 inches; red (2.5YR 4/6) clay; strong medium angular blocky structure; firm; thin continuous dark red (2.5YR 3/6) slickensides; strongly acid; gradual wavy boundary.

IIB24t—41 to 57 inches; red (2.5YR 4/6) clay; many medium distinct yellowish red (5YR 4/6) and reddish brown (5YR 4/4) mottles; strong medium angular blocky structure; firm; thick continuous dark red (2.5YR 3/6) slickensides; many fine black (10YR 2/1) iron and manganese oxide stains; strongly acid; abrupt wavy boundary.

IIB3—57 to 58 inches; reddish brown (5YR 4/4) clay; massive; firm; neutral; abrupt wavy boundary.

IIR—58 inches; limestone bedrock.

Thickness of the solum ranges from 40 to 60 inches, and the depth to limestone bedrock ranges from 40 to 60 inches. Thickness of the loess mantle ranges from 5 to 20 inches. Reaction of the upper part of the solum is strongly acid or very strongly acid, unless limed. Coarse fragments of limestone and chert range from 0 to 10 percent.

The Ap horizon has hue of 10YR, 7.5YR, or 5YR; value of 3 to 5; and chroma of 2 to 4. It is silt loam or silty clay loam with a clay content of 20 to 30 percent. The B2t horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 8. The IIB2t horizon has hue of 7.5YR, 5YR, or 2.5YR; value of 4 or 5; and chroma of 4 to 8.

Haymond series

The Haymond series consists of deep, well drained, moderately permeable soils. They formed in silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Haymond soils are similar to Wilbur soils and are commonly adjacent to Burnside, Cuba, and Wakeland soils. Wilbur soils have mottles of low chroma in the upper 20 inches. Burnside soils are more than 35 percent coarse fragments throughout the profile and are at the upper end of drainageways. Cuba soils have more clay in their control section and are strongly acid or very strongly acid throughout their profile. Wakeland soils are dominantly gray between the Ap horizon and a depth of 30 inches and are in lower lying positions on the landscape.

Typical pedon of Haymond silt loam, in a cultivated field; 1,240 feet east and 2,160 feet north of the southwest corner of sec. 28, T. 7 N., R. 1 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common medium roots; neutral; abrupt smooth boundary.

C1—10 to 20 inches; dark brown (10YR 4/3) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; few medium roots; neutral; clear wavy boundary.

C2—20 to 30 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; neutral; clear wavy boundary.

C3—30 to 60 inches; dark brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; neutral.

The reaction throughout the profile ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

Hickory series

The Hickory series consists of deep, well drained, moderately permeable soils. They formed in glacial till on uplands. Slopes range from 25 to 70 percent.

Hickory soils are similar to Princeton soils and are commonly adjacent to Alford, Chetwynd, and Ryker soils. Princeton soils have less clay in the B horizon. Alford and Ryker soils have more than 20 inches of loess and are less sloping than Hickory soils. Chetwynd soils are deeper to free carbonates and have a redder profile.

Typical pedon of Hickory silt loam, 25 to 70 percent slopes, in a wooded area, 5 feet east and 1,380 feet south of the northwest corner of sec. 15, T. 10 N., R. 2 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) and very dark brown (10YR 2/2) silt loam, pale brown (10YR 6/3) and grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

A2—2 to 4 inches; brown (10YR 5/3) silt loam; few medium distinct light yellowish brown (10YR 6/4) and dark grayish brown (10YR 4/2) mottles; weak thin platy structure; friable; many fine and medium roots; slightly acid; clear wavy boundary.

B1—4 to 9 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable;

common fine roots; 2 percent gravel; strongly acid; clear wavy boundary.

B21t—9 to 16 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and coarse subangular blocky structure; friable; common fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; extremely acid; clear wavy boundary.

B22t—16 to 41 inches; strong brown (7.5YR 5/6) clay loam; strong coarse subangular blocky structure; firm; few fine roots; thick continuous brown (7.5YR 5/4) clay films on faces of peds; 5 percent gravel; extremely acid, except medium acid in the lower part; clear wavy boundary.

C—41 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; 12 percent gravel; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 40 to 54 inches. Glacial pebbles are generally mixed throughout the lower part of the profile.

In some pedons there is an Ap horizon that has a hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 2. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The A horizon is silt loam or loam and is slightly acid to very strongly acid. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is medium acid to extremely acid. The B2t horizon is loam or clay loam. In some pedons a B3 horizon is present. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4, and some pedons are mottled. It is clay loam, loam, or a gravelly analog of these textures and is 5 to 20 percent gravel.

Hosmer series

The Hosmer series consists of well drained and moderately well drained soils that are moderately deep to a fragipan. They are on loess-covered uplands. They are moderately permeable above the fragipan and very slowly permeable within the fragipan. They formed in more than 4 feet of loess and the underlying residuum from limestone, shale, sandstone, or siltstone. Slopes range from 0 to 12 percent.

Hosmer soils are similar to Bedford, Tilsit, and Zanesville soils and are commonly adjacent to Alford, Crider, and Iva soils. Bedford, Tilsit, and Zanesville soils formed in less than 4 feet of loess, and Tilsit and Zanesville soils have a thinner solum than Hosmer soils. Alford, Crider, and Iva soils do not have a fragipan. Alford and Crider soils are on higher lying positions on the landscape. Iva soils also have mottles of low chroma in the upper 20 inches of the solum and are in depressional areas.

Typical pedon of Hosmer silt loam, 2 to 6 percent slopes, in a cultivated field; 2,200 feet west and 160 feet south of the northeast corner of sec. 3, T. 8 N., R. 2 W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1—11 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; many fine roots; neutral; abrupt wavy boundary.

B21t—14 to 19 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; neutral; clear wavy boundary.

B22t—19 to 23 inches; yellowish brown (10YR 5/6) silt loam; many fine distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/8) mottles; moderate medium and coarse prismatic structure; firm; few fine flat roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; medium acid; clear wavy boundary.

Bx1—23 to 32 inches; strong brown (7.5YR 5/6) and brown (7.5YR 4/4) silt loam; strong coarse and very coarse prismatic structure; very firm and brittle; thin discontinuous brown (10YR 5/3) clay films on faces of prisms; thin discontinuous light brownish gray (10YR 6/2) and pale brown (10YR 6/3) silt flows between faces of prisms; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

Bx2—32 to 38 inches; strong brown (7.5YR 5/6) and brown (7.5YR 4/4) silt loam; strong coarse and very coarse prismatic structure; very firm and brittle; thick continuous brown (10YR 5/3) clay films on faces of prisms; thin discontinuous light brownish gray (10YR 6/2) silt flows between faces of prisms; very strongly acid; clear wavy boundary.

Bx3—38 to 63 inches; mottled yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6 & 5/8) silt loam; strong coarse and very coarse prismatic structure; very firm and brittle; thick continuous grayish brown (10YR 5/2) clay films on faces of prisms; thick continuous light brownish gray (10YR 6/2) and pale brown (10YR 6/3) silt flows between faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; gradually wavy boundary.

C—63 to 72 inches; reddish yellow (7.5YR 6/8) silt loam; many medium distinct strong brown (7.5YR 5/6) mottles; massive; firm; thick continuous light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) silt splotches; very strongly acid.

The thickness of the solum ranges from 48 to 84 inches. Depth to a fragipan ranges from 23 to 36 inches, and it is 24 to 54 inches thick. The loess mantle ranges from 50 to 120 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It ranges from medium acid to neutral.

An A2 horizon, where there is one, has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam with a clay content of 20 to 30 percent. The Bx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8 and is either distinctly mottled or has gray silt coatings or clay films. It is silt loam or silty clay loam with a clay content of 20 to 30 percent. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8 and is distinctly mottled. It is medium acid to very strongly acid silt loam or silty clay loam.

Iva series

The Iva series consists of deep, somewhat poorly drained, slowly permeable soils. They are on loess-covered uplands. They formed in loess. Slope ranges from 0 to 3 percent.

Iva soils are commonly adjacent to Bedford, Crider, and Hosmer soils. Bedford, Crider, and Hosmer soils do not have mottles of low chroma in the upper 10 inches of the argillic horizon and are steeper. Bedford and Hosmer soils also have a fragipan.

Typical pedon of Iva silt loam, 0 to 3 percent slopes, in a cultivated field; 220 feet east and 60 feet north of the southwest corner of sec. 11, T. 8 N., R. 1 W.

Ap1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; many medium and coarse distinct gray (10YR 5/1) and dark gray (10YR 4/1) mottles; moderate medium granular structure; friable; many medium roots; slightly acid; abrupt wavy boundary.

Ap2—2 to 6 inches; grayish brown (10YR 5/2) silt loam; many medium and coarse distinct dark gray (10YR 4/1) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; many medium roots; many fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

A2—6 to 12 inches; light brownish gray (10YR 6/2) silt loam; many medium faint grayish brown (10YR 5/2) and gray (10YR 6/1) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium platy structure; friable; common fine roots; many fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B21t—12 to 18 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common medium faint gray (10YR 6/1) mottles; moderate medium prismatic structure parting to moderate and coarse subangular blocky; firm; common fine roots; thick continuous grayish brown (10YR 5/2) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B22t—18 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct gray (10YR 5/1) and yellowish red (5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; common fine roots; thick continuous grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

B23t—26 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct gray (10YR 5/1), yellowish red (5YR 4/8), and light gray (N 7/0) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; thick continuous gray (10YR 5/1) clay films on faces of peds; many fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B24t—32 to 37 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct strong brown (7.5YR 5/6), gray (N 6/0), and light brownish gray (10YR 6/2) mottles; moderate medium and coarse prismatic structure; firm; thick continuous gray (10YR 5/1) clay films on faces of peds; many fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B25t—37 to 41 inches; gray (10YR 6/1) silty clay loam; common medium and coarse distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse prismatic structure; firm; thick continuous gray (10YR 5/1) clay films on faces of peds; many fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B3—41 to 47 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct gray (10YR 6/2) and light gray (N 7/0) mottles; weak medium subangular blocky structure; firm; many fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

C—47 to 60 inches; light grayish brown (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/4) and light gray (10YR 7/1) and many medium faint gray (10YR 6/1) and pale brown (10YR 6/3) mottles; massive; firm; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The loess mantle is 5 to 10 feet thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 and is distinctly mottled. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3 and is distinctly mottled. In some pedons there is a B1 horizon. The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 8 and is distinctly mottled.

It is silt loam or silty clay loam with a clay content of 25 to 34 percent. The B3 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8 and has many mottles of low chroma. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2 and has many mottles of high chroma.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils. They formed in calcareous stratified silt, sand, and clay materials on terraces. Slopes range from 2 to 6 percent. These soils are more acid in the lower part of the B horizon than is defined in the range for the Martinsville series. This difference does not alter the use or behavior of the soil.

Martinsville soils are commonly adjacent to the Princeton, Whitaker, and Zipp Variant soils. Princeton soils do not have stratification in the lower part of the solum. Whitaker and Zipp Variant soils have mottles of low chroma in their subsoil and are in lower lying positions on the landscape. In addition, Zipp Variant soils have more than 42 percent clay in the control section.

Typical pedon of Martinsville loam, 2 to 6 percent slopes, in a cultivated field; 2,380 feet west and 1,060 feet north of the southeast corner of sec. 10, T. 10 N., R. 2 W.

Ap—0 to 12 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2—12 to 16 inches; brown (10YR 4/3) loam; common medium faint dark yellowish brown (10YR 4/4) mottles; moderate medium granular structure; friable; few fine roots; strongly acid; clear wavy boundary.

B1—16 to 20 inches; dark yellowish brown (10YR 4/4) loam; common fine faint brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few fine roots; medium acid; clear wavy boundary.

B21t—20 to 26 inches; yellowish brown (10YR 5/4) loam; many medium distinct dark brown (10YR 4/3) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous brownish yellow (10YR 6/6) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—26 to 34 inches; yellowish brown (10YR 5/6) loam; common medium distinct light yellowish brown (10YR 6/4) and dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brownish yellow (10YR 6/6) clay films on faces of peds; few fine iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B23t—34 to 40 inches; dark brown (7.5YR 4/4) clay loam; many medium distinct pinkish gray (7.5YR 6/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; clear wavy boundary.

B31—40 to 60 inches; yellowish red (5YR 5/6) loam; few medium distinct light brown (7.5YR 6/4) mottles; moderate medium subangular blocky structure; friable; very strongly acid; clear wavy boundary.

B32—60 to 67 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; friable; medium acid; clear wavy boundary.

C—67 to 70 inches; mottled dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) loamy sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 36 to 67 inches. The depth to free carbonates ranges from 60 to 80 inches.

The Ap horizon has hue of 10YR, value of 4; and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It is loam or silt loam. The B2t horizon has hue of 10YR, 7.5YR, and 5YR; value of 4 to 6; and chroma of 3 to 6. It is loam, clay loam, or sandy clay loam. The B3 horizon is similar in range of color to the B2t horizon. It is loam or clay loam, and in some pedons there is thin stratification of these textures. The C horizon is loamy sand or clay loam but ranges from gravelly loam to stratified layers of sand, loamy sand, clay loam, and loam. It is slightly acid to neutral.

Parke series

The Parke series consists of deep, well drained, moderately permeable soils. They are on sloping glacial outwash plains and terraces. They formed in loess and the underlying glacial outwash. Slopes range from 2 to 18 percent.

Parke soils are similar to Elkinsville and Chetwynd soils and are commonly adjacent to Ryker soils. Elkinsville soils are not as red as Parke soils and are on terraces. Chetwynd soils have a loess mantle less than 20 inches thick. Ryker soils are higher in clay content in the lower part of the solum and have a higher base saturation.

Typical pedon of Parke silt loam, 6 to 12 percent slopes, in a cultivated field; 800 feet north and 1,900 feet east of the southwest corner of sec. 2, T. 8 N., R. 1 E.

Ap1—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

Ap2—7 to 9 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; few fine roots; strongly acid; abrupt smooth boundary.

B21t—9 to 21 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; thin discontinuous yellowish brown (5YR 5/6) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—21 to 29 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (5YR 5/6) clay films on faces of peds; very strongly acid; clear wavy boundary.

IIB23t—29 to 36 inches; mottled yellowish red (5YR 5/6) and reddish brown (5YR 5/4) sandy clay loam; moderate coarse subangular blocky structure; friable; thin discontinuous yellowish red (5YR 5/6) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; abrupt wavy boundary.

IIB24t—36 to 38 inches; mottled yellowish red (5YR 5/6) and reddish brown (5YR 5/4) gravelly clay loam; weak medium subangular blocky structure; firm; thin discontinuous yellowish red (5YR 5/6) clay films on faces of peds; 20 percent fine gravel; strongly acid; abrupt wavy boundary.

IIB31—38 to 42 inches; mottled red (2.5YR 4/8) and yellowish red (5YR 4/8) sandy clay loam; weak medium subangular blocky structure; firm; very strongly acid; clear wavy boundary.

IIB32—42 to 50 inches; red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure; firm; very strongly acid; clear wavy boundary.

IIB33—50 to 80 inches; mottled red (2.5YR 4/8) and yellowish red (5YR 5/8) gravelly clay loam; weak medium subangular blocky structure; firm; 45 percent gravel; very strongly acid.

The thickness of the solum ranges from 48 to 100 inches. The loess mantle is 20 to 40 inches thick. The solum is strongly acid or very strongly acid, unless limed.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 3 or 4. In uncultivated areas the A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. In some pedons there is a B1 horizon. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The IIB2t horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 8. It is sandy clay loam, clay loam, or a gravelly analog of these textures. The IIB2t horizon is 0 to 35 percent gravel. The IIB3 horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 8. It is sandy clay loam, clay loam, or the gravelly analog of these textures, and it is 5 to 50 percent gravel.

Pekin series

The Pekin series consists of moderately well drained soils that are moderately deep to a fragipan. They are on broad terraces. They are moderately permeable above the fragipan and very slowly permeable within the fragipan. They formed in a mantle of thin loess and the underlying strongly acid alluvium. Slopes range from 0 to 12 percent.

Pekin soils are commonly adjacent to Bartle, Elkinsville, and Peoga soils. Bartle and Peoga soils have mottles of low chroma in the upper 20 inches of the soil and are in flat or depressional areas. Elkinsville soils do not have a fragipan or mottles of low chroma in the upper 10 inches of the argillic horizon.

Typical pedon of Pekin silt loam, 2 to 6 percent slopes, in a cultivated field; 220 feet south and 1,110 feet west of the northeast corner of sec. 32, T. 8 N., R. 1 E.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; many fine black (10YR 2/1) and dark reddish brown (2.5YR 3/4) iron and manganese oxide stains; few fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

B1—5 to 19 inches; yellowish brown (10YR 5/6) silt loam; few medium faint light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; common fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B21t—19 to 22 inches; pale brown (10YR 6/3) silty clay loam; many medium distinct yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and grayish brown (10YR 5/2) mottles; moderate medium prismatic structure; firm; few fine roots; thin patchy light brown (10YR 6/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—22 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure; firm; thin patchy light brown (10YR 6/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

B23t—28 to 32 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; moderate medium prismatic structure; firm; thin patchy light brown (10YR 6/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bx1—32 to 46 inches; light yellowish brown (10YR 6/4) silt loam; many medium distinct brownish yellow (10YR 6/8) and gray (10YR 6/1) mottles; strong very coarse prismatic structure; very firm and brittle; thick continuous gray (5YR 6/1) silt flows between faces of prisms; very strongly acid; clear wavy boundary.

Bx2—46 to 54 inches; brownish yellow (10YR 6/6) silt loam; many medium distinct light gray (10YR 7/1),

light brownish gray (10YR 6/2), and pale brown (10YR 6/3) mottles; strong very coarse prismatic structure; very firm and brittle; thick continuous gray (5YR 6/1) silt flows between faces of prisms; very strongly acid; clear wavy boundary.

C—54 to 60 inches; mottled light brown (7.5YR 6/4), pinkish gray (7.5YR 6/2), and reddish yellow (7.5YR 6/6) stratified silt loam, loam, and sandy loam; massive; firm; common fine black (10YR 2/1) and dark reddish brown (2.5YR 3/4) iron and manganese oxide stains; common fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Depth to a fragipan ranges from 24 to 36 inches, and it is 14 to 36 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B1 horizon has hue of 10YR, value of 5, and chroma of 4 to 6. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6 and is distinctly mottled. It is silt loam or silty clay loam with a clay content of 20 to 35 percent. The B2t horizon is strongly acid or very strongly acid. The Bx horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 8 and is distinctly mottled. It is silt loam or silty clay loam with a clay content of 20 to 30 percent. The Bx horizon is strongly acid or very strongly acid. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 8. It is stratified with thick layers of loam, sandy loam, silt loam, or clay loam.

Peoga series

The Peoga series consists of deep, poorly drained, slowly permeable soils. They are on broad glacial lake plains and on low alluvial terraces. They formed in loess underlain by stratified lakebed sediments. Slopes range from 0 to 2 percent.

Peoga soils are similar to Zipp and Zipp Variant soils and commonly adjacent to Bartle and Bonnie soils. Bonnie, Zipp, and Zipp Variant soils do not have an argillic horizon. Zipp Variant soils also have less than 60 percent gray colors in some subhorizon below the Ap horizon. The Bartle soils have a fragipan and do not have mottles of low chroma in their surface layer. They are in higher lying positions on the landscape.

Typical pedon of Peoga silt loam, in a cultivated field; 340 feet north and 2,340 feet west of the southeast corner of sec. 31, T. 10 N., R. 2 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A2g—8 to 15 inches; light gray (10YR 7/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; few fine black (10YR 2/1) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

B1g—15 to 22 inches; gray (10YR 6/1) silt loam; common medium distinct dark brown (10YR 4/3) mottles; weak coarse subangular blocky structure; firm; few fine roots; common fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear irregular boundary.

B21tg—22 to 33 inches; gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; thin discontinuous gray (10YR 6/1) clay films on faces of peds; thick continuous gray (10YR 6/1) silt flows on faces of peds and in voids; many fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B22tg—33 to 44 inches; gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; thin discontinuous gray (10YR 6/1) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; medium acid; clear irregular boundary.

B23tg—44 to 80 inches; dark gray (10YR 4/1) silty clay loam; common medium faint dark brown (10YR 4/3) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; thin continuous gray (10YR 5/1) clay films on faces of peds; thin continuous gray (10YR 5/1) silt flows on faces of peds and in voids; many fine black (10YR 2/1) and brown (10YR 4/3) iron and manganese oxide accumulations; slightly acid; gradual wavy boundary.

The thickness of the solum ranges from 48 to more than 80 inches. Reaction ranges from slightly acid to very strongly acid throughout the solum, unless limed.

The Ap horizon has hue of 10YR, value of 4 to 7, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2 and is distinctly mottled. The B1g horizon is gray (10YR 5/1 & 6/1), light brownish gray (10YR 6/2), or light gray (10YR 7/1) and is distinctly mottled. It is silt loam or silty clay loam with a clay content of 20 to 30 percent. The B2tg horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2 and is distinctly mottled. It is silt loam or silty clay loam and has a clay content of 20 to 35 percent. The C horizon, where there is one, is stratified silt loam, silty clay loam, loam, or sandy loam, and the acidity decreases with depth.

Princeton series

The Princeton series consists of deep, well drained soils. Permeability is moderate in the solum and

moderately rapid in the substratum. These soils are along large streams. They formed in thick deposits of coarse silt and fine sand of eolian origin on uplands. Slopes range from 4 to 25 percent.

Princeton soils are commonly adjacent to Martinsville, Stonelick, and Whitaker soils. Martinsville and Whitaker soils formed in stratified waterlaid materials and are in lower lying terrace positions on the landscape. The Whitaker soils also have mottles of low chroma in their subsoil. Stonelick soils are on bottom land and do not have an argillic horizon.

Typical pedon of Princeton loam, 4 to 10 percent slopes, in a cultivated field; 455 feet south and 1,020 feet east of the northwest corner of sec. 4, T. 10 N., R. 2 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21t—7 to 12 inches; yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

B22t—12 to 18 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; neutral; clear wavy boundary.

B23t—18 to 30 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; slightly acid; clear wavy boundary.

B24t—30 to 40 inches; brown (7.5YR 5/4) clay loam; common medium distinct light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; friable; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; medium acid; clear wavy boundary.

B25t—40 to 46 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; friable; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B3—46 to 68 inches; strong brown (7.5YR 5/6) fine sandy loam with thin banding of loam; weak coarse subangular blocky structure; friable; medium acid; clear wavy boundary.

C—68 to 80 inches; yellowish brown (10YR 5/6) stratified fine sand and silt; many common distinct light yellowish gray (10YR 6/2) mottles; massive; friable; medium acid.

Thickness of the solum ranges from 40 to 68 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. In uncultivated areas the A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. Some pedons have an A2 horizon or B1 horizon. The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 4 to 6. It is sandy clay loam, clay loam, loam, or fine sandy loam, and it is neutral to strongly acid. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 6. It is stratified, and reaction is medium acid to very strongly acid.

Ryker series

The Ryker series consists of deep, well drained, moderately permeable soils. They are on loess-covered uplands. They formed in loess and the underlying glacial till and residuum from limestone. Slopes range from 2 to 18 percent.

Ryker soils are similar to Crider soils and are commonly adjacent to Alford, Chetwynd, Hickory, and Iva soils. Crider soils do not have glacial till material. Alford soils have a thicker loess cap then Ryker soils and have less clay in the lower part of the solum. Chetwynd soils are lower in clay and higher in sand in the lower part of the solum and have a lower base saturation. Hickory soils have more than 20 inches of loess. The Chetwynd and Hickory soils are generally in the more sloping areas. Iva soils have mottles of low chroma in the subsoil and are in flat or depressional areas.

Typical pedon of Ryker silt loam, 6 to 12 percent slopes, in a cultivated field; 520 feet east and 1,320 feet south of the northwest corner of sec. 18, T. 10 N , R. 2 W.

Ap1—0 to 7 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Ap2—7 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium granular structure; friable; many fine roots; medium acid; abrupt wavy boundary.

B1—12 to 15 inches; strong brown (7.5YR 5/6) silt loam; common medium distinct reddish yellow (7.5YR 6/8) mottles; moderate medium subangular blocky structure; friable; many fine roots; medium acid; clear wavy boundary.

B21t—15 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—18 to 30 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay

films on faces of peds; strongly acid; clear wavy boundary.

IIB23t—30 to 42 inches; yellowish red (5YR 5/6) clay loam; many medium and coarse distinct pale brown (10YR 6/3), yellowish brown (10YR 5/8), and brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB24t—42 to 46 inches; yellowish red (5YR 5/6) clay loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB25t—46 to 60 inches; yellowish red (5YR 5/6) clay loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIIB26t—60 to 78 inches; yellowish red (5YR 5/8) clay; moderate coarse angular blocky structure; firm; thick continuous yellowish red (5YR 5/8) clay films on faces of peds; medium acid; abrupt wavy boundary.

IIIR—78 inches; limestone bedrock.

The thickness of the solum ranges from 70 to more than 100 inches, and depth to bedrock ranges from 6 to more than 10 feet. The thickness of the loess is 24 to 40 inches. Depth to clay residuum ranges from 40 to more than 100 inches. Unless the soil is limed, the upper part of the solum is medium acid to very strongly acid and the lower part is strongly acid to neutral.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8, and it is silt loam or silty clay loam. The IIBt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is clay loam, loam, silty clay loam, or silt loam. The IIIBt horizon has hue of 7.5YR, 5YR, or 2.5YR; value of 4 or 5; and chroma of 6 to 8. It is silty clay or clay or a cherty analog of these textures. It has 0 to 30 percent coarse fragments.

Steff series

The Steff series consists of deep, moderately well drained, moderately permeable soils. They formed in acid silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Steff soils are similar to Cuba soils and are commonly adjacent to Burnside, Stendal, and Wakeland soils. Cuba soils do not have mottles of low chroma within a depth of 20 inches and are on higher lying positions on the landscape. Haymond and Wakeland soils have a higher base saturation than Steff soils. Burnside soils have more than 35 percent coarse fragments throughout the profile and are on the upper end of drainageways. Stendal and Wakeland soils are dominantly gray between the Ap horizon and a depth of 30 inches and are in the lower lying positions.

Typical pedon of Steff silt loam, in a cultivated field; 560 feet north and 1,800 feet east of the southwest corner of sec. 3, T. 8 N., R. 1 E.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

B21—10 to 15 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; very strongly acid; clear wavy boundary.

B22—15 to 18 inches; yellowish brown (10YR 5/4) silt loam; many fine and medium faint pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; very strongly acid; clear wavy boundary.

B23—18 to 27 inches; yellowish brown (10YR 5/4) silt loam; many fine and medium distinct pale brown (10YR 6/3), light gray (10YR 7/2), and light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular blocky structure; friable; very strongly acid; clear wavy boundary.

B24—27 to 39 inches; yellowish brown (10YR 5/4) silt loam; many medium and coarse distinct light gray (10YR 7/2) and very pale brown (10YR 7/3) mottles; moderate fine and medium subangular blocky structure; friable; very strongly acid; clear wavy boundary.

B25—39 to 49 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; very strongly acid; gradual wavy boundary.

C—49 to 60 inches; light olive brown (2.5YR 5/4) silt loam; many medium and coarse distinct light brownish gray (10YR 6/2) mottles; massive; firm; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid.

The thickness of the solum ranges from 30 to 50 inches. Reaction throughout the solum is strongly acid or very strongly acid, unless the soil is limed.

The Ap horizon is brown (10YR 4/3). The upper part of the B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. There are many mottles of low chroma within a depth of 20 inches. The lower part of the B2 horizon is yellowish brown (10YR 5/4) with many mottles of low chroma or is light brownish gray (10YR 6/2 or 2.5Y 6/2) with many mottles of high chroma. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6 and has distinct mottles.

Stendal series

The Stendal series consists of deep, somewhat poorly drained, moderately permeable soils. They formed in acid silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Stendal soils are similar to Bonnie and Wakeland soils and are commonly adjacent to Cuba, Steff, Wilbur, and Zipp frequently flooded soils. Bonnie and Zipp frequently flooded soils have more than 60 percent gray in the subsoil below the Ap horizon and are in depressions. Wakeland and Wilbur soils have a higher base saturation than Stendal soils. Cuba, Steff, and Wilbur soils have higher chroma in their subsoil and are in higher lying positions on the landscape.

Typical pedon of Stendal silt loam, in a cultivated field; 1,600 feet south and 1,700 feet west of the northeast corner of sec. 25, T. 10 N., R. 2 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, brownish yellow (10YR 6/6) dry; common medium distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt wavy boundary.

B21g—9 to 24 inches; light brownish gray (10YR 6/2) silt loam; many medium and coarse distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) and many medium faint gray (10YR 7/2) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; common fine roots; few medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B22g—24 to 50 inches; pale brown (10YR 6/3) silt loam; many medium and coarse faint light brownish gray (10YR 6/2) and many medium distinct yellowish brown (10YR 5/6 & 5/4) mottles; weak medium subangular blocky structure parting to moderate medium and coarse granular; friable; few fine roots; common fine dark reddish brown (5YR 3/4) iron stains on faces of peds; common medium black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

Cg—50 to 60 inches; light brownish gray (10YR 6/2) silt loam; many medium and coarse distinct yellowish brown (10YR 5/4, 5/6, & 5/8) mottles; massive; friable; many fine and medium dark reddish brown (5YR 3/4) iron and manganese oxide stains on faces of peds; many black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid.

Reaction throughout the soil is strongly acid or very strongly acid, unless limed.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3 and has mottles of high chroma. The Cg horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or 3 and has distinct mottles.

Stonelick series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils. They are on bottom land along large streams. They formed in alluvium washed mainly from areas of calcareous loamy glacial drift that was neutral to moderately alkaline. Slopes range from 0 to 2 percent.

Stonelick soils are similar to Cuba and Haymond soils and are commonly adjacent to Wakeland and Wilbur soils. Cuba soils lack free carbonates and have a more acid profile. Haymond soils lack the free carbonates and have less than 15 percent fine sand in the control section. Wakeland and Wilbur soils have mottles of 2 chroma within a depth of 20 inches and are generally in small depressions.

Typical pedon of Stonelick silt loam, in a cultivated field; 2,060 feet south and 2,400 feet west of the northeast corner of sec. 32, T. 11 N., R. 2 W.

Ap—0 to 11 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure parting to moderate medium granular; friable; many fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—11 to 25 inches; dark brown (10YR 4/3) loam; moderate coarse subangular blocky structure parting to moderate medium and coarse granular; friable; common fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C2—25 to 44 inches; dark yellowish brown (10YR 4/4) fine sandy loam; massive; friable; few fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C3—44 to 53 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C4—53 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; friable; common medium distinct pale brown (10YR 6/3) uncoated coarse sand grains; strong effervescence; mildly alkaline; clear wavy boundary.

The soil is mildly alkaline or moderately alkaline and typically has free carbonates throughout.

The Ap horizon is dark brown (10YR 3/3 & 4/3) or brown (10YR 5/3) silt loam or loam. The C horizon is dark brown (10YR 4/3), dark yellowish brown (10YR 4/4), or yellowish brown (10YR 5/4). The lower part consists of strata of loam, silt loam, sandy loam, or fine sand which generally becomes coarser with depth.

Tilsit series

The Tilsit series consists of moderately well drained soils that are moderately deep to a fragipan. They are on loess-covered uplands. They are moderately permeable above the fragipan and very slowly permeable within the fragipan. These soils formed in loess and the underlying residuum from sandstone, siltstone, and shale. Slopes range from 0 to 6 percent.

Tilsit soils are similar to Bedford, Hosmer, and Zanesville soils and are commonly adjacent to Gilpin and Wellston soils. Bedford soils have a red argillic horizon below the fragipan. Hosmer soils formed in more than 4 feet of silty loess and have a thicker solum than Tilsit soils. Zanesville soils have hue of 7.5YR in the upper part of the solum and also have a higher base saturation. Gilpin and Wellston soils do not have a fragipan and are generally in steeper areas.

Typical pedon of Tilsit silt loam, 2 to 6 percent slopes, in a cultivated field; 800 feet west and 600 feet north of the southeast corner of sec. 4, T. 8 N., R. 2 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common medium roots; few splotches of yellowish brown (10YR 5/6); strongly acid; abrupt smooth boundary.

B21t—9 to 16 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin continuous strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; clear wavy boundary.

B22t—16 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; common fine and medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; thin continuous strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bx1—26 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct pale brown (10YR 6/3) and light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; very firm and brittle; thin continuous light gray (10YR 7/2) silt coatings on faces of prisms; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

Bx2—34 to 48 inches; mottled yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) silty clay loam; moderate very coarse prismatic structure; very firm and brittle; very strongly acid; clear wavy boundary.

IIB3—48 to 58 inches; mottled brown (10YR 5/3), yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and gray (10YR 6/1) channery silty clay loam; moderate medium subangular blocky structure; firm; 15 percent sandstone fragments; very strongly acid; abrupt wavy boundary.

R—58 inches; hard sandstone bedrock.

The thickness of the solum ranges from 40 to 60 inches. The depth to sandstone, siltstone, or shale bedrock typically ranges from 48 to 80 inches. Depth to the fragipan ranges from 18 to 28 inches, and it is 20 to 30 inches thick. The loess mantle ranges from 20 to 48 inches in thickness. Reaction throughout the solum is strongly acid or very strongly acid, unless the soil is limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Some pedons have a B1 horizon. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 8. It is silt loam or silty clay loam with a clay content of 20 to 33 percent. The Bx horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 6. It is silt loam or silty clay loam with a clay content of 20 to 30 percent. The IIB3 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 6. It is silt loam or silty clay loam or a channery analog of these textures with a clay content of 20 to 35 percent. The IIB3 horizon is strongly acid or very strongly acid. Sandstone fragments range from 5 to 20 percent.

Wakeland series

The Wakeland series consists of deep, somewhat poorly drained, moderately permeable soils. They formed in silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Wakeland soils are similar to Bonnie and Stendal soils and are commonly adjacent to Haymond, Steff, Wilbur, and Zipp frequently flooded soils. Bonnie and Zipp frequently flooded soils have more than 60 percent gray in the subsoil below the Ap horizon and are in depressions. Stendal soils are more acid throughout the profile than Wakeland soils. Haymond, Steff, and Wilbur soils have higher chroma in their subsoil and are in higher lying positions on the landscape. Steff soils also are more acid throughout the profile.

Typical pedon of Wakeland silt loam, in a cultivated field; 100 feet north and 1,000 feet east of the southwest corner of sec. 24, T. 10 N., R. 2 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; common medium distinct light yellowish brown (10YR 6/4) and pale brown (10YR 6/3) mottles; moderate medium granular structure; friable; many fine roots; few fine black (10YR 2/1) iron and manganese oxide accumulations; mildly alkaline; abrupt smooth boundary.

C1g—9 to 28 inches; grayish brown (10YR 5/2) silt loam; many medium and coarse distinct brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6) and many medium faint light brownish gray (10YR 6/2) mottles; massive; friable; few fine roots; common dark reddish brown (5YR 3/3) iron and manganese oxide stains; common medium black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

C2g—28 to 44 inches; pale brown (10YR 6/3) silt loam; many medium and coarse faint light brownish gray (10YR 6/2) and many medium distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottles; massive; friable; common fine dark reddish brown (5YR 3/3) iron and manganese oxide stains; common medium black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

C3g—44 to 60 inches; light brownish gray (10YR 6/2) silt loam; many medium and coarse distinct yellowish brown (10YR 5/4) mottles; massive; friable; many fine dark reddish brown (5YR 3/3) iron and manganese oxide stains; many medium black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

The reaction throughout the soil ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3 and has mottles of high chroma. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4, and it is mottled. The mottles have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 6.

Weikert series

The Weikert series consists of shallow, well drained soils. Permeability is moderately rapid. They formed in residuum from sandstone, siltstone, and shale on uplands. Slopes range from 25 to 75 percent.

Weikert soils are similar to Berks soils and are commonly adjacent to Gilpin and Wellston soils. Berks, Gilpin, and Wellston soils have a thicker solum than Weikert soils and are deeper to the lithic contact. The Berks soils have sandstone, siltstone, or shale bedrock within 20 to 40 inches of the surface and are in less sloping areas. Gilpin and Wellston soils have an argillic horizon and are in less sloping areas.

Typical pedon of Weikert shaly silt loam from an area of Berks-Weikert complex, 25 to 75 percent slopes, in a woods; 2,460 feet west and 35 feet north of southeast corner of sec. 18, T. 8 N., R. 1 E.

A1—0 to 6 inches; brown (10YR 4/3) shaly silt loam, light yellowish brown (10YR 6/4) dry; weak fine and medium granular structure; friable; many fine roots; 30 percent shale fragments; strongly acid; clear wavy boundary.

B21—6 to 12 inches; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) shaly silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; common fine and medium roots; 45 percent shale fragments; strongly acid; clear wavy boundary.

B22—12 to 15 inches; dark yellowish brown (10YR 4/4) very shaly silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; few fine and medium roots; 50 percent shale fragments; strongly acid; gradual irregular boundary.

Cr—15 to 18 inches; dark yellowish brown (10YR 4/4) very shaly silt loam; soil material is within bedding planes and cracks or fissures; 70 percent hard shale; strongly acid; abrupt smooth boundary.

R—18 inches; hard siltstone.

The thickness of the solum and the depth to bedrock range from 10 to 20 inches. Coarse fragments of sandstone, siltstone, or shale occur throughout the profile. Unless the soil is limed, reaction of the profile ranges from medium acid to very strongly acid.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is shaly or channery silt loam and has 30 to 40 percent coarse fragments. In some pedons an A2 horizon is present. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. It has 30 to 56 percent coarse fragments and is channery, very channery, shaly, or very shaly silt loam.

Wellston series

The Wellston series consists of deep, well drained, moderately permeable soils on loess-covered uplands. They formed in loess deposits and the underlying residuum from sandstone, siltstone, or shale. Slopes range from 6 to 20 percent.

Wellston soils are similar to Gilpin soils and adjacent to Berks, Tilsit, and Zanesville soils. Gilpin soils have less than 35 percent rock fragments, a lithic contact within a depth of 40 inches, and less than 35 percent base saturation. Berks soils do not have an argillic horizon, and Tilsit and Zanesville soils have fragipans. Berks soils are generally in steeper areas. Tilsit soils are in less sloping areas.

Typical pedon of Wellston silt loam, 6 to 12 percent slopes, in a cultivated field; 1,200 feet west and 1,000 feet south of the northeast corner of sec. 31, T. 9 N., R. 1 E.

Ap1—0 to 1 inch; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Ap2—1 to 6 inches; yellowish brown (10YR 5/4) silt loam; moderate medium granular structure; friable; many fine roots; medium acid; clear wavy boundary.

B1—6 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; few fine roots; common medium yellowish brown (10YR 5/4 and 5/6) splotches; strongly acid; clear wavy boundary.

B21t—12 to 21 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 5/4)

clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—21 to 29 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 5/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB23t—29 to 36 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous brown (7.5YR 5/4) silt coatings on faces of peds; 5 percent sandstone fragments; very strongly acid; clear wavy boundary.

IIB24t—36 to 41 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct pale brown (10YR 6/3), light brownish gray (10YR 6/2), and light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; 5 percent sandstone fragments; very strongly acid; clear wavy boundary.

IIC—41 to 50 inches; mottled pale brown (10YR 6/3), yellowish brown (10YR 5/6), light yellowish brown (10YR 6/4), and light brownish gray (10YR 6/2) channery silt loam; massive; firm; 35 percent sandstone coarse fragments; very strongly acid.

IIR—50 inches; hard sandstone rock.

Thickness of the solum ranges from 32 to 50 inches. Depth to bedrock ranges from 40 to 72 inches. The loess mantle is 20 to 40 inches thick. The solum is strongly acid or very strongly acid, unless limed. Coarse fragments of sandstone, siltstone, or shale are in the lower part of the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. In uncultivated areas the A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon, if there is one, has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. It is silt loam or silty clay loam with a clay content of 20 to 35 percent. The B2t horizon has less than 10 percent coarse fragments, and the IIB2t horizon has 5 to 50 percent. The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. It is silt loam, silty clay loam, or a channery analog of these textures. Some pedons have a IIB3 horizon. The IIC horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is a channery or very channery analog of silt loam or loam and has 15 to 60 percent coarse fragments. The IIC horizon is strongly acid.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils. They formed in stratified silty and sandy outwash or lacustrine sediments on terraces. Slopes range from 0 to 2 percent. These soils have a thicker, more acid solum than is defined in the range for the Whitaker series. This difference does not alter the use or behavior of the soil.

Whitaker soils are commonly adjacent to Elkinsville, Martinsville, and Zipp Variant soils. Elkinsville and Martinsville soils do not have mottles of low chroma in the upper 10 inches of the argillic horizon and are in more sloping areas. Zipp Variant soils have more than 42 percent clay in the control section and are in lower lying areas on the landscape.

Typical pedon of Whitaker loam, in a cultivated field; 320 feet east and 1,720 feet north of southwest corner of sec. 11, T. 10 N., R. 2 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, light yellowish brown (10YR 6/4) dry; few fine distinct yellowish brown (10YR 5/6) and brown (10YR 5/3) mottles; moderate medium granular structure; friable; many fine and medium roots; medium acid; abrupt smooth boundary.

B21t—8 to 14 inches; pale brown (10YR 6/3) sandy clay loam; many fine distinct yellowish brown (10YR 5/4 and 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

B22t—14 to 21 inches; dark gray (10YR 4/1) clay loam; many medium distinct dark yellowish brown (10YR 4/4) and olive gray (5YR 4/2) mottles; strong medium and coarse subangular blocky structure; firm; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B23t—21 to 34 inches; grayish brown (10YR 5/2) clay loam; many fine and medium distinct yellowish brown (10YR 5/6) and many fine and medium faint brown (10YR 5/3) and gray (10YR 5/1) mottles; moderate medium prismatic structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; many coarse black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

B24t—34 to 45 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/8 and 5/4), strong brown (7.5YR 5/6), and light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B25t—45 to 60 inches; mottled gray (10YR 5/1), strong brown (7.5YR 5/6), and light yellowish brown (10YR

6/4) clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

B3—60 to 75 inches; mottled strong brown (7.5YR 5/6) and gray (10YR 6/1) sandy clay loam; moderate medium subangular blocky structure; firm; strongly acid; clear wavy boundary.

C—75 to 80 inches; strong brown (7.5YR 5/6) stratified loamy sand and loam; many medium distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; massive; friable; very strongly acid.

The thickness of the solum is 36 to 75 inches. The solum is medium acid to very strongly acid, unless limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3. It is loam or sandy loam. Some pedons have a B1 horizon. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 6 and is mottled. It is clay loam, sandy clay loam, loam, or sandy loam. The C horizon is stratified. It is silty clay loam, sandy clay loam, clay loam, loam, sandy loam, and loamy sand. The C horizon is very strongly acid to medium acid.

Wilbur series

The Wilbur series consists of deep, moderately well drained, moderately permeable soils. They formed in silty alluvium on flood plains. Slopes range from 0 to 2 percent.

Wilbur soils are similar to Haymond soils and are commonly adjacent to Cuba, Steff, and Wakeland soils. Cuba and Haymond soils do not have mottles of low chroma within a depth of 20 inches and are on higher lying positions on the landscape. Cuba, Steff, and Stendal soils are more acid throughout the profile than Wilbur soils. Stendal and Wakeland soils are dominantly gray between the Ap horizon and a depth of 30 inches and are in lower lying positions.

Typical pedon of Wilbur silt loam, in a cultivated field; 750 feet west and 900 feet north of the southeast corner of sec. 3, T. 8 N., R. 2 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

C1—10 to 14 inches; dark brown (10YR 4/3) silt loam; many medium distinct pale brown (10YR 6/3) mottles; moderate medium granular structure; friable; thin stratification of silt loam; common fine yellowish red (5YR 4/6) iron and manganese oxide stains on faces of some peds; few fine roots; slightly acid; clear wavy boundary.

C2—14 to 24 inches; dark brown (10YR 4/3) silt loam; few fine faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; friable; thin stratification of silt loam; medium acid; clear wavy boundary.

C3—24 to 42 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4), brown (10YR 5/3), and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; thin stratification of silt loam; neutral; gradual wavy boundary.

C4—42 to 60 inches; mottled pale brown (10YR 6/3), dark yellowish brown (10YR 4/4), and grayish brown (10YR 5/2) stratified loam and silt loam; massive; friable; neutral.

The reaction throughout the soil ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The upper part of the C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6 and has few to common mottles of low chroma within a depth of 20 inches. Some pedons do not have thin stratification within the silt loam. The lower part of the C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6 and has distinct mottles. It is stratified loam and silt loam. The control section averages less than 15 percent fine sand and between 12 and 18 percent clay.

Zanesville series

The Zanesville series consists of well drained soils that are moderately deep to a fragipan on loess-covered uplands. The permeability is moderate above the fragipan and slow within the fragipan. These soils formed in loess underlain by residuum from sandstone, siltstone, and shale. Slopes range from 6 to 12 percent.

Zanesville soils are similar to Hosmer soils and are commonly adjacent to Tilsit, Gilpin, and Wellston soils. Hosmer soils formed in more than 4 feet of silty loess and have a thicker solum than Zanesville soils. Gilpin and Wellston soils do not have a fragipan and are generally in more sloping areas. Tilsit soils have hue of 10YR in the upper part of the argillic horizon and have a lower base saturation.

Typical pedon of Zanesville silt loam, 6 to 12 percent slopes, eroded, in a cultivated field; 1,150 feet east and 660 feet north of the southwest corner of sec. 2, T. 8 N., R. 2 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; few strong brown (7.5YR 5/6) splotches; neutral; abrupt smooth boundary.

B21t—6 to 12 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—12 to 17 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B23t—17 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

B24t—21 to 28 inches; mottled yellowish brown (10YR 5/6) and pale brown (10YR 6/3) silty clay loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bx—28 to 39 inches; mottled yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and light brownish gray (10YR 6/2) silty clay loam; moderate very coarse prismatic structure; very firm and brittle; thin continuous light brownish gray (10YR 6/2) silt flows between faces of prisms and in voids; very strongly acid; clear wavy boundary.

IIB3—39 to 48 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct light brownish gray (10YR 6/2) and brownish yellow (10YR 6/8) mottles; moderate medium angular blocky structure; firm; few fine black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

IIC1—48 to 54 inches; strong brown (7.5YR 5/6) silty clay; massive; very firm; common medium distinct yellow (10YR 7/8) and brownish yellow (10YR 6/8) uncoated sand grains; 5 percent sandstone fragments; very strongly acid; clear wavy boundary.

IIC2—54 to 60 inches; brownish yellow (10YR 6/8) clay loam; common medium faint yellow (10YR 7/8) and yellowish brown (10YR 5/6) and few medium distinct light brownish gray (10YR 6/2) mottles; massive; very firm; 5 percent sandstone fragments; strongly acid.

IIR—60 inches; sandstone bedrock.

Thickness of the solum ranges from 36 to 60 inches. Depth to the fragipan ranges from 23 to 32 inches, and it is 12 to 24 inches thick. Depth to bedrock ranges from 40 to 80 inches. Thickness of the loess mantle ranges from 24 to 48 inches. Reaction throughout the solum is strongly acid or very strongly acid, unless the soil is limed.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Some pedons have a B1 horizon. The B2t horizon has hue of 5YR, 7.5YR, or 10YR; value of 4 or 5; and chroma of 4 to 6. It ranges from silt loam to silty clay loam with a clay content of 20 to 33 percent. The Bx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6 and has many mottles of low chroma. It is loam, silt loam, or silty clay loam with a clay content of 12 to 33 percent. The Bx horizon has 0 to 15 percent sandstone fragments. The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 5 to 8 and has many mottles of low chroma. It is silty clay or clay loam or a channery analog of these textures and has 5 to 50 percent sandstone fragments.

Zipp series

The Zipp series consists of deep, very poorly drained, very slowly permeable and slowly permeable soils. They formed in calcareous lacustrine sediments on bottom land and terraces. Slopes range from 0 to 2 percent.

Zipp soils are commonly adjacent to Bonnie, Stendal, and Zipp Variant soils. Bonnie and Stendal soils have less than 42 percent clay in the control section and are generally in slightly higher positions on the landscape. Zipp Variant soils have less than 60 percent gray in the subsoil below the Ap horizon and are on slightly higher lying positions.

Typical pedon of Zipp silty clay loam, frequently flooded, in a cultivated field; 940 feet north and 1,360 feet west of the southeast corner of sec. 24, T. 10 N., R. 2 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, pale brown (10YR 6/3) dry; common medium distinct dark brown (10YR 4/3) and strong brown (7.5YR 5/6) mottles; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21g—8 to 13 inches; dark gray (10YR 4/1) silty clay; few medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; common fine roots; neutral; clear wavy boundary.

B22g—13 to 19 inches; gray (10YR 5/1) silty clay; common medium distinct strong brown (7.5YR 5/8) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B23g—19 to 32 inches; dark gray (10YR 4/1) clay; common medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) mottles; strong coarse angular blocky structure; firm; few fine black (10YR 7/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

B3g—32 to 40 inches; mottled dark gray (10YR 4/1), gray (10YR 5/1), yellowish brown (10YR 5/6), and strong brown (7.5YR 7/8) clay; strong coarse angular blocky structure; firm; few fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

C1g—40 to 52 inches; mottled gray (10YR 5/1 and 6/1), yellowish brown (10YR 5/6), and light brownish gray

(10YR 6/2) silty clay; massive; firm; neutral; clear wavy boundary.

C2g—52 to 60 inches; gray (10YR 5/1) silty clay; few medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; few fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

The thickness of the solum ranges from 30 to 40 inches. The solum ranges from slightly acid to neutral.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2 and has distinct mottles. It is silty clay loam or silty clay with a clay content of 15 to 45 percent. The Bg horizon has hue of 10YR, value of 4 to 6, and chroma of 1 and has distinct mottles. It is silty clay or clay with a clay content of 40 to 55 percent. The C horizon is clay or silty clay. Below a depth of 80 inches some pedons have thin layers of silty clay loam and silty clay.

Zipp Variant

The Zipp Variant consists of deep, somewhat poorly drained, slowly permeable, soils. They formed in calcareous lacustrine deposits on nearly level flood plains. Slopes range from 0 to 2 percent.

Zipp Variant soils are commonly adjacent to Bonnie, Stendal, Whitaker, and Zipp soils. Bonnie and Zipp soils have more than 60 percent gray in the subsoil and are in depressions. Stendal and Whitaker soils have less than 42 percent clay in the control section and are on higher lying positions on the landscape.

Typical pedon of Zipp Variant silt loam, 0 to 3 percent slopes, in a cultivated field; 1,100 feet north and 1,500 feet east of the southwest corner of sec. 14, T. 10 N., R. 2 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

A2—6 to 10 inches; dark grayish brown (10YR 4/2) silt loam; common medium faint grayish brown (10YR 5/2) mottles; moderate coarse granular structure; friable; many fine and medium roots; neutral; clear wavy boundary.

B21—10 to 19 inches; brown (10YR 4/3) silty clay loam; many medium faint brown (10YR 5/3) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many fine and medium roots; common discontinuous faint thin grayish brown (10YR 5/2) coatings on faces of peds; neutral; clear wavy boundary.

B22g—19 to 26 inches; grayish brown (10YR 5/2) silty clay; many medium distinct dark yellowish brown (10YR 4/4) and brown (10YR 4/3) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; common fine roots; common discontinuous faint thin grayish brown (10YR 5/2) coatings on faces of peds; medium acid; clear wavy boundary.

B23g—26 to 36 inches; grayish brown (10YR 5/2) silty clay; many medium distinct olive brown (2.5Y 4/4) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; common discontinuous faint thin grayish brown (2.5Y 5/2) coatings on faces of peds; medium acid; clear wavy boundary.

B24g—36 to 55 inches; grayish brown (10YR 5/2) silty clay; many medium distinct light olive brown (2.5YR 5/4) mottles; strong medium prismatic structure; firm; many continuous faint thick gray (10YR 5/1) coatings on faces of peds; few fine soft masses of lime; neutral; clear wavy boundary.

B3g—55 to 70 inches; gray (10YR 5/1) stratified silty clay and clay; many medium and coarse distinct olive brown (2.5Y 4/4) mottles; massive; firm; common discontinuous distinct thick dark gray (10YR 4/1) coatings on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

C—70 to 80 inches; light brownish gray (10YR 6/2) stratified silt loam and silt; common medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; massive; friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 35 to 55 inches. The loess mantle is less than 12 inches thick. Depth to carbonates ranges from 30 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3. It is silt loam or silty clay loam. The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4 and has distinct mottles. It is silty clay loam or silty clay with a clay content of 42 to 50 percent. It ranges from strongly acid to neutral. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4 and has distinct mottles. It is stratified clay, silty clay, silty clay loam, silt loam, and silt.

formation of the soils

In this section the major factors of soil formation and their degree of importance in the formation of the soils in the county are discussed.

factors of soil formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time, generally a long time, is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

parent material

Parent material is the unconsolidated mass from which a soil is formed. Parent material determines the limits of the chemical and mineralogical composition of the soil. The parent material from which many of the soils of Monroe County are derived was weathered from limestone, sandstone, shale, and siltstone. All of these rocks are Mississippian (approximately 250 million years) in age except for some of the capping sandstone in the western part of the county, which is Pennsylvanian (approximately 230 million years). The parent material of the rest of the soils consists of deposits of Illinoian age glacial till, outwash, and lacustrine materials and of deposits of loess and alluvium. The parent materials of the soils that are of glacial origin were deposited by glaciers or by melt water from the glaciers. Some of these materials are reworked and redeposited by subsequent actions of water and wind. These glaciers covered part of the county from about 40,000 to 45,000 years ago. Although different parent material are of common glacial origin their properties vary greatly, sometimes within short distances, depending on how the materials were deposited.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of particles of different sizes that are mixed together. The small pebbles in glacial till have sharp corners that indicate they have not been worn by water washing. The glacial till in the county is moderately acid to calcareous and firm. Its texture is loam, sandy clay loam, or clay loam. An example of soils formed in glacial till are those of the Ryker series. These soils typically are medium textured and have well-developed structure.

Outwash materials are deposited by running water from melting glaciers. The size of the particles that make up outwash material varies according to the speed of the stream of water that carried them. When the water slows down, the coarser particles are deposited. Finer particles, such as very fine sand, silt, and clay, can be carried by slower moving water. Outwash deposits generally consist of layers of particles of similar size, such as sandy loam, sand, gravel, and other coarse particles. The Martinsville soils, for example, formed in deposits of outwash material.

Lacustrine materials are deposited from still, or ponded, glacial melt water. Because the coarser fragments drop out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay remain to settle out in still water. Lacustrine deposits are silty or clayey. The Zipp Variant series is an example of soils formed in lacustrine materials.

Alluvial material is deposited by the floodwater of streams in recent time. This material varies in texture depending on the speed of the water from which it was deposited. The alluvium deposited along a swift stream like the White River is coarser in texture than that deposited along a slow, sluggish stream like Bean Blossom Creek. Examples of alluvial soils are the Stonelick and Haymond series.

plant and animal life

Plants are the principal organism that has influenced the soils in Monroe County; however, bacteria, fungi, earthworms, and the activities of man have also been important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew on it. The remains of these plants accumulate on the surface, decay, and eventually become organic matter. Roots of the plants provide channels for downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by plants.

Vegetation in the county was mainly deciduous forests. Differences in natural soil drainage and minor changes in parent material have affected the composition of the forest species.

In general the well drained upland soils, such as those of the Alford, Crider, Ebal, and Hagerstown series, were mainly covered with sugar maple, beech, poplar, and oaks. The Weikert soils were covered with scrub oak. Pin oak grew mostly on wet soils. The soils that developed under forest generally have less total accumulation of organic matter than soils in other parts of the county that developed under grass.

climate

Climate is important in the formation of soils. It determines the kind of plant and animal life on and in the soil. It determines the amount of water available for weathering of minerals and the transporting of soil materials. Climate, through its influence on temperature in the soil, determines the rate of chemical reaction that occurs in the soil. These influences are important, but they affect large areas rather than a relatively small area, such as a county.

The climate in Monroe County is cool and humid. It is presumably similar to the climate which existed when the soils formed. The soils in the county differ from those that formed in a dry, warm climate or from those that formed in a hot, moist climate. Climate is uniform throughout the county, although its effect is modified locally by the cooling effect of the hills and by runoff. Therefore the differences in the soils, to a minor extent, results from the differences in climate. For more detailed information on the climate of this county, see the section "General nature of the county."

relief

Relief, or topography, has a marked influence on the soils through its effect on natural drainage, erosion, plant cover, and soil temperature. In Monroe County slopes range from 0 to 75 percent. Natural soil drainage ranges from well drained on the ridgetops to very poorly drained in the depressions.

Because relief affects runoff and drainage, drainage in turn, through its effect on aeration of the soil, determines the color of the soil. Runoff is greatest on the steeper slopes, but in low areas water is temporarily ponded. Water and air move freely through soils that are well drained but slowly through soils that are very poorly drained. In soils that are well aerated, the iron and aluminum compounds are brightly colored and oxidized, and in poorly aerated soils the color is a dull gray and mottled. The Princeton series is an example of a well drained, well aerated soil, and the Zipp series is an example of a poorly aerated, very poorly drained soil.

Intermediate between the very poorly drained and well drained soils are the poorly drained, somewhat poorly drained, and moderately well drained soils.

time

Time, generally a long time, is required to form distinct horizons in the soil from parent material. The difference in length of time that the parent material has been in place reflects the degree of development of the soil profile. Some soils develop rapidly; others, slowly.

The soils in the county range from young to mature. The glacial deposits from which many of the soils formed have been exposed to soil-forming factors for a long enough time to allow distinct horizons to develop. Some soils, however, that formed in recent alluvial sediments have not been in place long enough for distinct horizons to develop.

The Haymond series is an example of a young soil that formed in alluvial material. The soils of the Crider and Hagerstown series are examples of how time has affected the leaching of lime from the soil. The solum of the Martinsville series, however, has had about the same amount of lime as is in the C horizon today. The soils of the Zipp series were submerged under glacial lake water and protected from leaching. In contrast, the soils of the Whitaker series were above water and subject to leaching. The difference in length of time of leaching is reflected in the Peoga soils and other soils which are leached of lime to a depth of 80 inches. On the other hand, Zipp Variant soils are limy or calcareous at a depth of 36 inches.

processes of soil formation

Several processes have been involved in the formation of the soils of this county. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the formation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils of this county. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, like the Corydon Variant soils, have a thick black surface horizon.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in this county. Leaching is generally believed to precede the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because the water table is high or because water moves slowly through such soils.

Clay accumulates in pores and other voids and forms films on the surface along which water moves. Leaching of bases and translocation of silicate clays are among the more important processes in horizon differentiation. Soils of the Alford series are examples of soils in which translocated silicate clays have accumulated in the B2t horizon in the form of clay films.

The reduction and transfer of iron, or gleying, has occurred in all of the very poorly drained and somewhat poorly drained soils. In the naturally wet soils, this process has been significant in horizon differentiation. The gray color of the subsoil indicates the redistribution of iron oxides. The reduction is commonly accompanied by some transfer of the iron, either from upper horizons to lower horizons or completely out of the profile. Mottles that are in some horizons indicate segregation of iron.

references

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. l0, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. In 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Conservation Needs Committee. 1968. Indiana soil and water conservation needs inventory. 224 pp., illus.

(4) Indiana University. 1968. Park and recreation survey—part one. HPER. R675. 67 pp., illus.

(5) League of Women Voters of Bloomington. 1973. A Guide, Bloomington, Monroe County, Indiana. 56 pp., illus.

(6) United States Department of Agriculture. 1928. Soil survey of Monroe County, Indiana. 1723-1770., illus.

(7) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(8) United States Department of Agriculture. 1972. Profile of Indiana's Population and Housing. Econ., Coop. Extension Serv. Purdue Univ., Lafayette, Indiana. EC-413, 61 pp., illus.

(9) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(10) United States Department of Commerce, Bureau of the Census. 1971. 1969 Census of Agriculture. 425-432., illus.

glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Break. Any sudden change in topography between two landforms.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.
Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.
Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.
Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

Cr horizon. —Soft weathered rock or other consolidated material.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interfluve. The area between two adjacent streams with the same direction of flow.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nose slope. The projecting end of a hill, spur, ridge, or mountain.

Nutrient, plant. Any element a plant takes in that is essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slip. A landform where there has been displacement of soil downslope, which generally has the appearance of a bench.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils

are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	39.3	21.2	30.3	66	-9	0	2.87	1.44	4.03	6	2.4
February---	43.1	23.3	33.2	68	-6	0	2.61	1.27	3.69	6	2.4
March------	51.7	31.7	41.6	79	11	46	3.92	2.13	5.38	9	.1
April------	66.0	43.6	54.8	86	23	186	3.80	2.35	5.09	8	.6
May--------	75.6	52.7	64.4	91	34	453	4.40	2.59	6.01	9	.0
June-------	83.2	61.6	72.4	96	45	672	4.41	2.73	5.92	8	.0
July-------	87.0	65.3	76.2	97	50	812	4.47	2.50	6.06	7	.0
August-----	85.5	63.3	74.4	97	49	756	3.35	2.01	4.55	5	.0
September--	79.8	56.8	68.3	95	38	549	3.42	1.42	5.03	5	.0
October----	69.4	45.2	57.3	89	26	251	2.31	.98	3.38	5	.0
November---	53.5	34.9	44.2	81	13	35	3.38	2.02	4.58	7	.7
December---	42.0	25.2	33.4	67	-4	8	3.40	1.76	4.73	8	1.5
Year-----	64.7	43.7	54.2	99	-9	3,768	42.34	37.47	46.99	83	7.7

[1]Recorded in the period 1951-75 at Bloomington, Ind.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1] 24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 11	April 19	May 6
2 years in 10 later than--	April 5	April 15	April 30
5 years in 10 later than--	March 26	April 8	April 18
First freezing temperature in fall:			
1 year in 10 earlier than--	November 1	October 18	October 11
2 years in 10 earlier than--	November 5	October 23	October 16
5 years in 10 earlier than--	November 13	October 31	October 25

[1]Recorded in the period 1951-75 at Bloomington, Ind.

TABLE 3.--GROWING SEASON

Probability	Daily minimum temperature during growing season[1] Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	209	190	167
8 years in 10	217	195	175
5 years in 10	232	206	189
2 years in 10	247	217	203
1 year in 10	255	222	210

[1]Recorded in the period 1951-75 at Bloomington, Ind.

TABLE 4.--POTENTIAL AND LIMITATIONS OF GENERAL SOIL MAP UNITS FOR SPECIFIED USES

Map unit	Extent of unit	Cultivated crops	Woodland	Urban uses	Intensive recreation areas
	Pct				
Berks-Weikert	39	Poor: slope, erosion, depth to rock.	Poor: coarse fragments, slope, depth to rock.	Poor: slope, depth to rock.	Poor: slope.
Crider-Caneyville	30	Fair: slope, erosion, karst topography (sinkholes)	Good	Fair: slope, depth to rock.	Fair: slope.
Ebal-Gilpin-Tilsit	11	Poor: slope, erosion.	Good	Poor: slope, low strength, shrink-swell.	Poor: slope, reduced permeability of clayey shale, wetness in Tilsit soil.
Haymond-Stendal	9	Good	Good	Poor: floods.	Fair: floods.
Ryker-Hickory	6	Fair: slope, erosion, karst topography (sinkholes)	Good	Poor: slope, low strength, shrink-swell.	Poor: slope.
Hosmer-Crider	4	Fair: slope, erosion.	Good	Fair: slope.	Fair: slope.
Peoga-Bartle	1	Fair: wet.	Fair: wet.	Poor: wet.	Poor: wet.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AfB	Alford silt loam, 2 to 6 percent slopes	900	0.3
Ba	Bartle silt loam	1,532	0.6
BdB	Bedford silt loam, 2 to 6 percent slopes	7,680	2.9
BkF	Berks-Weikert complex, 25 to 75 percent slopes	64,833	24.5
Bo	Bonnie silt loam	1,345	0.5
Bu	Burnside silt loam	6,275	2.4
CaD	Caneyville silt loam, 12 to 18 percent slopes	15,730	6.0
Cb	Caneyville-Hagerstown silt loams, karst	2,435	0.9
ChF	Chetwynd silt loam, 25 to 70 percent slopes	1,790	0.7
CoF	Corydon Variant-Caneyville Variant complex, 25 to 70 percent slopes	3,320	1.3
CrB	Crider silt loam, 2 to 6 percent slopes	6,205	2.4
CrC	Crider silt loam, 6 to 12 percent slopes	31,630	11.9
CrD	Crider silt loam, 12 to 18 percent slopes	840	0.3
CsC	Crider-Caneyville silt loams, 6 to 12 percent slopes	1,730	0.7
CtB	Crider-Urban land complex, 2 to 6 percent slopes	1,965	0.7
CtC	Crider-Urban land complex, 6 to 12 percent slopes	4,210	1.6
Cu	Cuba silt loam	2,185	0.8
EbE	Ebal-Gilpin-Hagerstown silt loams, 18 to 25 percent slopes	5,405	2.0
EdD	Ebal-Wellston-Gilpin silt loams, 12 to 18 percent slopes	10,175	3.9
EkB	Elkinsville silt loam, 2 to 6 percent slopes	685	0.3
EkF	Elkinsville silt loam, upland, 20 to 40 percent slopes	2,835	1.1
GpD	Gilpin silt loam, 12 to 18 percent slopes	790	0.3
GrD	Gilpin-Gullied land complex, 12 to 22 percent slopes	230	0.1
HaC	Hagerstown silt loam, 6 to 12 percent slopes	825	0.3
HaD	Hagerstown silt loam, 12 to 18 percent slopes	5,505	2.1
HaE	Hagerstown silt loam, 18 to 25 percent slopes	300	0.1
HbD3	Hagerstown silty clay loam, 12 to 22 percent slopes, severely eroded	285	0.1
Hc	Hagerstown-Caneyville silt loams, karst	1,960	0.7
Hd	Haymond silt loam	6,560	2.5
HkF	Hickory silt loam, 25 to 70 percent slopes	2,040	0.8
HoA	Hosmer silt loam, 0 to 2 percent slopes	530	0.2
HoB	Hosmer silt loam, 2 to 6 percent slopes	4,575	1.7
HoC	Hosmer silt loam, 6 to 12 percent slopes	2,180	0.8
HtB	Hosmer-Urban land complex, 2 to 12 percent slopes	635	0.2
IvA	Iva silt loam, 0 to 3 percent slopes	1,250	0.5
MbB	Martinsville loam, 2 to 6 percent slopes	230	0.1
PaB	Parke silt loam, 2 to 6 percent slopes	480	0.2
PaC	Parke silt loam, 6 to 12 percent slopes	850	0.3
PcD	Parke-Chetwynd silt loams, 12 to 18 percent slopes	530	0.2
PeA	Pekin silt loam, 0 to 2 percent slopes	410	0.2
PeB	Pekin silt loam, 2 to 6 percent slopes	1,380	0.5
PeC	Pekin silt loam, 6 to 12 percent slopes	725	0.3
Po	Peoga silt loam	1,755	0.7
PrC	Princeton loam, 4 to 10 percent slopes	135	0.1
PrE	Princeton loam, 18 to 25 percent slopes	230	0.1
RcB	Ryker silt loam, 2 to 6 percent slopes	495	0.2
RcC	Ryker silt loam, 6 to 12 percent slopes	1,410	0.5
RcD	Ryker silt loam, 12 to 18 percent slopes	610	0.2
Sf	Steff silt loam	1,490	0.6
St	Stendal silt loam	3,820	1.4
Sx	Stonelick silt loam	555	0.2
TlA	Tilsit silt loam, 0 to 2 percent slopes	790	0.3
TlB	Tilsit silt loam, 2 to 6 percent slopes	3,855	1.5
Ua	Udorthents, loamy	2,590	1.0
Ud	Udorthents-Pits complex	1,590	0.6
Wa	Wakeland silt loam	1,155	0.4
WeC	Wellston silt loam, 6 to 12 percent slopes	4,590	1.7
WmC	Wellston-Gilpin silt loams, 6 to 20 percent slopes	16,370	6.2
Wo	Whitaker loam	280	0.1
Wr	Wilbur silt loam	420	0.2
ZnC	Zanesville silt loam, 6 to 12 percent slopes	1,785	0.7
Zo	Zipp silty clay loam	185	0.1
Zp	Zipp silty clay loam, frequently flooded	695	0.3
Zs	Zipp Variant silt loam	510	0.2
	Water	12,390	4.7
	Total	263,680	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
AfB----------------------- Alford	120	42	48	4.0	8.0
Ba------------------------ Bartle	110	38	50	3.6	7.2
BdB----------------------- Bedford	95	33	43	3.1	6.2
BkF----------------------- Berks-Weikert	---	---	---	---	---
Bo------------------------ Bonnie	113	37	46	4.0	8.0
Bu------------------------ Burnside	103	35	45	3.7	7.4
CaD----------------------- Caneyville	---	---	---	---	---
Cb------------------------ Caneyville-Hagerstown	---	---	---	3.5	7.0
ChF----------------------- Chetwynd	---	---	---	---	---
CoF----------------------- Corydon Variant- Caneyville Variant	---	---	---	1.0	2.0
CrB----------------------- Crider	120	42	48	4.0	8.0
CrC----------------------- Crider	95	33	43	3.6	7.2
CrD----------------------- Crider	85	30	38	3.2	6.4
CsC----------------------- Crider-Caneyville	82	30	38	3.2	6.4
CtB----------------------- Crider-Urban land	---	---	---	---	---
CtC----------------------- Crider-Urban land	---	---	---	---	---
Cu------------------------ Cuba	105	35	---	3.0	8.0
EbE----------------------- Ebal-Gilpin-Hagerstown	---	---	---	2.2	4.4
EdD----------------------- Ebal-Wellston-Gilpin	---	---	---	2.6	5.2
EkB----------------------- Elkinsville	120	42	48	4.0	8.0
EkF----------------------- Elkinsville	---	---	---	---	---

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
GpD------------------------ Gilpin	---	---	---	2.5	5.0
GrD------------------------ Gilpin-Gullied land	---	---	---	---	---
HaC------------------------ Hagerstown	90	32	38	3.5	7.0
HaD------------------------ Hagerstown	110	---	---	3.0	6.0
HaE, HbD3------------------ Hagerstown	110	---	---	3.0	6.0
Hc------------------------- Hagerstown-Caneyville	---	---	---	---	---
Hd------------------------- Haymond	110	39	---	3.7	8.0
HkF------------------------ Hickory	---	---	---	---	---
HoA------------------------ Hosmer	105	37	47	3.4	6.8
HoB------------------------ Hosmer	105	37	47	3.4	6.8
HoC------------------------ Hosmer	95	33	43	3.1	6.2
HtB------------------------ Hosmer-Urban land	---	---	---	---	---
IvA------------------------ Iva	135	47	54	4.4	8.8
MbB------------------------ Martinsville	120	42	48	4.0	8.0
PaB------------------------ Parke	115	40	46	3.8	7.6
PaC------------------------ Parke	105	37	42	3.4	6.8
PcD------------------------ Parke-Chetwynd	---	---	---	---	---
PeA, PeB------------------- Pekin	105	37	47	3.4	6.8
PeC------------------------ Pekin	95	33	43	3.1	6.2
Po------------------------- Peoga	125	44	50	4.1	8.2
PrC------------------------ Princeton	85	30	38	2.8	5.6
PrE------------------------ Princeton	---	---	---	2.0	4.0
RcB------------------------ Ryker	120	42	48	4.0	8.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
RcC Ryker	110	38	44	3.6	7.2
RcD Ryker	---	---	38	3.1	6.2
Sf Steff	110	45	---	5.0	9.0
St Stendal	115	46	---	4.3	8.6
Sx Stonelick	80	28	---	3.5	6.5
TlA Tilsit	100	30	36	4.0	8.0
TlB Tilsit	100	30	36	4.0	8.0
Ua**. Udorthents					
Ud Udorthents-Pits	---	---	---	---	---
Wa Wakeland	115	40	---	4.4	8.8
WeC Wellston	100	---	40	4.0	8.0
WmC Wellston-Gilpin	94	---	---	3.6	7.2
Wo Whitaker	125	44	50	4.1	8.2
Wr Wilbur	115	44	50	4.1	8.2
ZnC Zanesville	80	30	---	3.5	7.0
Zo, Zp Zipp	105	37	42	3.4	6.8
Zs Zipp Variant	100	35	45	2.3	4.6

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	---	---	---	---	---
II	56,847	29,085	26,822	940	---
III	70,420	66,440	3,980	---	---
IV	20,885	20,885	---	---	---
V	---	---	---	---	---
VI	26,975	26,975	---	---	---
VII	71,983	71,983	---	---	---
VIII	---	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
AfB Alford	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
Ba Bartle	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum	75 85 85 80	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
BdB Bedford	3o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Virginia pine Sugar maple	70 75 90 75 75	Eastern white pine, yellow-poplar, white ash.
BkF*: Berks	3f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, black oak, red pine.
Weikert	4d	Moderate	Severe	Severe	Moderate	Northern red oak Virginia pine	64 60	Eastern white pine, black oak, Virginia pine.
Bo Bonnie	2w	Slight	Severe	Severe	Severe	Pin oak Eastern cottonwood Sweetgum Cherrybark oak American sycamore	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, sweetgum, pin oak.
Bu Burnside	1o	Slight	Slight	Slight	Slight	Eastern cottonwood Yellow-poplar American sycamore Cherrybark oak Sweetgum Southern red oak	105 95 --- --- --- ---	Black walnut, American sycamore, eastern cottonwood, pin oak, red maple, yellow-poplar, ash, red oak.
CaD Caneyville	3c	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern redcedar	70 80 45	Yellow-poplar, Virginia pine.
Cb*: Caneyville	3c	Slight	Moderate	Moderate	Slight	Northern red oak Yellow-poplar Eastern redcedar	69 80 45	Virginia pine, eastern white pine.
Hagerstown	1c	Slight	Moderate	Moderate	Slight	Northern red oak Yellow-poplar	85 95	Black walnut, yellow-poplar, eastern white pine.
ChF Chetwynd	1r	Severe	Severe	Slight	Slight	Yellow-poplar Northern red oak	99 88	Eastern white pine, black walnut, yellow-poplar.
CoF*: Corydon Variant	3d	Severe	Severe	Severe	Moderate	Northern red oak White oak Yellow-poplar	70 69 80	Virginia pine, eastern white pine, yellow-poplar, black walnut.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Management concerns: Equip- ment limita- tion	Management concerns: Seedling mortal- ity	Management concerns: Wind- throw hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
CoF*:								
Caneyville Variant	3c	Moderate	Severe	Moderate	Slight	Northern red oak---- White oak----------- Yellow-poplar------- Eastern redcedar----	70 68 80 45	Virginia pine, eastern white pine, yellow-poplar, black walnut.
CrB, CrC----------- Crider	1o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------	88 97 78 80	Eastern white pine, black oak, red oak, white oak, yellow-poplar, black walnut, white ash.
CrD---------------- Crider	1r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------	88 97 78 80	Eastern white pine, black oak, red oak, white oak, yellow-poplar, black walnut, white ash.
CsC*:								
Crider------------	1o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------	88 97 78 80	Eastern white pine, black oak, red oak, white oak, yellow-poplar, black walnut, white ash.
Caneyville--------	3c	Slight	Moderate	Moderate	Slight	Northern red oak---- Yellow-poplar------- Eastern redcedar----	69 80 45	Eastern redcedar, Virginia pine, eastern white pine, shortleaf pine.
Cu----------------- Cuba	1o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, white ash, black walnut, yellow-poplar.
EbE*:								
Ebal--------------	2c	Moderate	Moderate	Moderate	Moderate	Black oak----------- Northern red oak---- Yellow-poplar-------	80 --- ---	Yellow-poplar, eastern white pine, white ash, northern red oak, black oak, black locust.
Gilpin------------	2r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar-------	80 95	Eastern white pine, Virginia pine, black cherry, yellow-poplar.
Hagerstown--------	1c	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar-------	85 95	Black walnut, yellow-poplar, eastern white pine.
EdD*:								
Ebal--------------	2c	Moderate	Moderate	Moderate	Moderate	Black oak----------- Northern red oak---- Yellow-poplar-------	80 --- ---	Yellow-poplar, eastern white pine, white ash, northern red oak, black oak.
Wellston----------	2r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine-------	81 97 76	Eastern white pine, black walnut, yellow-poplar, red oak, white oak.
Gilpin------------	2r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar-------	80 95	Virginia pine, eastern white pine, black cherry, yellow-poplar.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
EkB----------------- Elkinsville	1o	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	Eastern white pine, white oak, red pine, white ash, yellow-poplar, black walnut.
EkF----------------- Elkinsville	1r	Moderate	Moderate	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
GpD, GrD------------ Gilpin	2r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar-------	80 95	Eastern white pine, Virginia pine, black cherry, yellow-poplar.
HaC----------------- Hagerstown	1c	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar-------	85 95	Yellow-poplar, eastern white pine, red oak, white oak.
HaD, HaE, HbD3------ Hagerstown	1c	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar-------	85 95	Yellow-poplar, eastern white pine, red oak, white oak.
Hc*: Hagerstown---------	1c	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar-------	85 95	Yellow-poplar, eastern white pine, red oak, white oak.
Caneyville---------	3c	Moderate	Moderate	Moderate	Slight	Northern red oak---- Yellow-poplar------- Eastern redcedar----	70 80 45	Eastern white pine, Virginia pine, northern red oak, yellow-poplar.
Hd------------------ Haymond	1o	Slight	Slight	Slight	Slight	Yellow-poplar------- White oak----------- Black walnut--------	100 90 70	Eastern white pine, red oak, ash, black walnut, yellow-poplar.
HkF----------------- Hickory	1r	Severe	Severe	Slight	Slight	White oak----------- Northern red oak---- Black oak----------- Green ash----------- Bitternut hickory--- Yellow-poplar-------	85 85 --- --- --- 95	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
HoA, HoB, HoC------- Hosmer	2o	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Virginia pine------- Sugar maple---------	75 90 75 75	Eastern white pine, yellow-poplar, white ash.
IvA----------------- Iva	2o	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	75 85 85 80	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
MbB----------------- Martinsville	1o	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
PaB, PaC: Parke	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, black walnut, yellow-poplar, white ash.
PcD*: Parke	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, black walnut, yellow-poplar, white ash.
Chetwynd	1r	Slight	Slight	Slight	Slight	Yellow-poplar Northern red oak	99 88	Eastern white pine, black walnut, yellow-poplar.
PeA, PeB, PeC: Pekin	3o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Virginia pine Sugar maple	70 85 75 75	Eastern white pine, Virginia pine, yellow-poplar, white ash.
Po: Peoga	2w	Slight	Severe	Severe	Moderate	Pin oak White oak Sweetgum	90 75 90	Eastern white pine, red maple, white ash, sweetgum.
PrC: Princeton	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, black walnut, yellow-poplar, white ash.
PrE: Princeton	1r	Moderate	Moderate	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, black walnut, yellow-poplar, white ash.
RcB, RcC, RcD: Ryker	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, black walnut, yellow-poplar, white ash.
Sf: Steff	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	80 95	Yellow-poplar, eastern white pine, red oak, white oak, sweetgum, black walnut.
St: Stendal	2o	Slight	Slight	Slight	Slight	Pin oak Sweetgum Yellow-poplar Virginia pine	90 85 90 90	Eastern white pine, American sycamore, red maple, white ash.
Sx: Stonelick	2o	Slight	Slight	Slight	Slight	Northern red oak	80	Eastern white pine, black walnut, yellow-poplar, white ash.
TlA, TlB: Tilsit	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	70 89 80 70 78	Eastern white pine, Virginia pine, green ash, yellow-poplar.
Wa: Wakeland	2o	Slight	Slight	Slight	Slight	Pin oak Sweetgum Yellow-poplar Virginia pine	90 88 90 85	Eastern white pine, American sycamore, red maple, white ash, yellow-poplar.
WeC: Wellston	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Virginia pine	71 90 70	Eastern white pine, red oak, white oak, black walnut, yellow-poplar.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
WmC*:								
Wellston	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Virginia pine	71 90 70	Eastern white pine, red oak, white oak, black walnut, yellow-poplar.
Gilpin	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	80 95	Virginia pine, eastern white pine, black cherry, yellow-poplar.
Wo Whitaker	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum Northern red oak	70 85 85 80 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Wr Wilbur	1o	Slight	Slight	Slight	Slight	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar.
ZnC Zanesville	3o	Slight	Slight	Slight	Slight	Northern red oak Virginia pine	68 70	Virginia pine, eastern white pine, shortleaf pine.
Zo, Zp Zipp	2w	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	88 75 90	Eastern white pine, red maple, white ash, sweetgum.
Zs Zipp Variant	2c	Slight	Slight	Moderate	Moderate	Pin oak Sweetgum Northern red oak White ash Red maple	87 90 76 --- ---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
AfB: Alford	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Norway spruce	Eastern white pine.
Ba: Bartle	Cutleaf staghorn sumac.	Blackhaw, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Norway spruce, white spruce.	Eastern white pine.
BdB: Bedford	Cutleaf staghorn sumac.	Blackhaw, cornelian cherry, dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, Norway spruce, white spruce.	American basswood, red pine.
BkF*:					
Berks.					
Weikert	American hazel, flowering quince.	Blackhaw, forsythia, lilac, autumn-olive, late lilac.	Jack pine, Austrian pine, Russian-olive, Amur maple.	Virginia pine, red pine, scarlet oak, eastern white pine.	---
Bo: Bonnie	Arrowwood, redosier dogwood, gray dogwood.	Silky dogwood, forsythia.	Amur maple, baldcypress.	Pin oak, green ash	Eastern cottonwood, American sycamore, red maple.
Bu: Burnside	Redosier dogwood, gray dogwood.	Silky dogwood, autumn-olive.	Amur maple, baldcypress, northern white-cedar.	Norway spruce, eastern white pine.	American sycamore, eastern cottonwood, red maple.
CaD: Caneyville	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
Cb*:					
Caneyville	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
Hagerstown	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
ChF: Chetwynd	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce	Eastern white pine.
CoF*:					
Corydon Variant	---	Blackhaw, forsythia, lilac, autumn-olive, Amur honeysuckle.	Jack pine, Austrian pine, Russian-olive.	Virginia pine, red pine, scarlet oak.	---
Caneyville Variant	---	Blackhaw, forsythia, lilac, autumn-olive, Amur honeysuckle.	Jack pine, Austrian pine, Russian-olive.	Virginia pine, red pine, scarlet oak.	---
CrB, CrC, CrD: Crider	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
CsC*:					
Crider	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
Caneyville	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
CtB*, CtC*:					
Crider	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
Urban land.					
Cu: Cuba	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce	Eastern white pine.
EbE*:					
Ebal	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple	Norway spruce, eastern hemlock, Austrian pine.	Eastern white pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
EbE*:					
Gilpin	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, Russian-olive.	Austrian pine	Eastern white pine, Norway spruce.
Hagerstown.					
EdD*:					
Ebal	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple	Norway spruce, eastern hemlock, Austrian pine.	Eastern white pine.
Wellston	---	Tatarian honeysuckle, winged euonymus, nannyberry viburnum, autumn-olive, Amur honeysuckle.	Norway spruce, Scotch pine, red pine, northern white-cedar.	Eastern white pine, Austrian pine.	---
Gilpin	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, Russian-olive.	Austrian pine	Eastern white pine, Norway spruce.
EkB, EkF Elkinsville	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar.	Norway spruce, Austrian pine.	Eastern white pine, red pine.
GpD Gilpin	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, Russian-olive.	Austrian pine	Eastern white pine, Norway spruce, red pine.
GrD*:					
Gilpin	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, Russian-olive.	Austrian pine	Eastern white pine, Norway spruce, red pine.
Gullied land.					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
HaC, HaD, HaE, HbD3: Hagerstown	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
Hc*: Hagerstown	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
Caneyville	---	Blackhaw, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Eastern white pine, red pine.	---
Hd: Haymond	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Eastern white pine, Norway spruce, red pine.	---
HkF. Hickory					
HoA, HoB, HoC: Hosmer	---	Blackhaw, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	American basswood, Norway spruce, white spruce.	Eastern white pine.
HtB*: Hosmer	---	Blackhaw, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	American basswood, Norway spruce, white spruce.	Eastern white pine.
Urban land.					
IvA: Iva	---	Blackhaw, arrowwood, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	American basswood, Norway spruce, white spruce.	Eastern white pine.
MbB: Martinsville	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce	Eastern white pine, red pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
PaB, PaC: Parke	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce	Eastern white pine.
PcD*:					
Parke	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce	Eastern white pine.
Chetwynd	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce	Eastern white pine.
PeA, PeB, PeC: Pekin	---	Blackhaw, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	American basswood, Norway spruce, white spruce.	Eastern white pine, red pine.
Po: Peoga	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Eastern cottonwood.
PrC, PrE: Princeton	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce, Austrian pine.	Eastern white pine.
RcB, RcC, RcD: Ryker	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Northern white-cedar, Amur maple.	Norway spruce	Eastern white pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
Sf: Steff	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Eastern hemlock, northern white-cedar, Amur maple.	Norway spruce	Eastern white pine.
St: Stendal	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Eastern cottonwood.
Sx: Stonelick	Tatarian honeysuckle, Amur honeysuckle.	Nannyberry viburnum, autumn-olive, European burningbush.	Eastern redcedar, northern white-cedar, Amur maple.	Norway spruce, Austrian pine.	Eastern white pine, black locust.
TlA, TlB: Tilsit	---	Blackhaw, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	American basswood, Norway spruce, white spruce.	Eastern white pine, red pine.
Ua*. Udorthents					
Ud*: Udorthents.					
Pits.					
Wa: Wakeland	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Eastern cottonwood.
WeC: Wellston	---	Forsythia, Tatarian honeysuckle, winged euonymus, nannyberry viburnum, autumn-olive, Amur honeysuckle.	Norway spruce, Scotch pine, red pine.	Eastern white pine, Austrian pine.	---
WmC*: Wellston	---	Forsythia, Tatarian honeysuckle, winged euonymus, nannyberry viburnum, autumn-olive, Amur honeysuckle.	Norway spruce, Scotch pine, red pine.	Eastern white pine, Austrian pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
WmC*: Gilpin	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, Russian-olive.	Austrian pine	Eastern white pine, Norway spruce.
Wo Whitaker	---	Autumn-olive, Amur honeysuckle, American cranberrybush, blackhaw, arrowwood, cornelian cherry dogwood.	Amur maple, northern white-cedar.	Norway spruce, white spruce, American basswood.	Eastern white pine.
Wr Wilbur	---	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	Norway spruce	Eastern white pine.
ZnC Zanesville	---	Blackhaw, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	Amur maple, northern white-cedar.	American basswood, Norway spruce, white spruce.	Eastern white pine.
Zo, Zp Zipp	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Eastern cottonwood.
Zs Zipp Variant	---	Blackhaw, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive, hazelnut.	Amur maple, northern white-cedar.	Eastern white pine, Norway spruce, white spruce.	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AfB: Alford	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Ba: Bartle	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
BdB: Bedford	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
BkF*:					
Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope.
Weikert	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope.
Bo: Bonnie	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, erodes easily.	Severe: wetness, floods.
Bu: Burnside	Severe: floods.	Slight	Moderate: floods.	Severe: erodes easily.	Moderate: large stones, floods, thin layer.
CaD: Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Cb*:					
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Hagerstown	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
ChF: Chetwynd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CoF*:					
Corydon Variant	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope.
Caneyville Variant	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: slope.	Severe: slope.
CrB: Crider	Slight	Slight	Moderate: slope.	Slight	Slight.
CrC: Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CrD: Crider	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CsC*:					
Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Caneyville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
CtB*:					
Crider	Slight	Slight	Moderate: slope.	Slight	Slight.
Urban land.					
CtC*:					
Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Urban land.					
Cu Cuba	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.
EbE*:					
Ebal	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
EdD*:					
Ebal	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
EkB Elkinsville	Severe: floods.	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
EkF Elkinsville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
GpD Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
GrD*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Gullied land.					
HaC Hagerstown	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
HaD Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
HaE, HbD3 Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Hc*:					
Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Hd Haymond	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.
HkF Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
HoA, HoB Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
HoC Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
HtB*:					
Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
Urban land.					
IvA Iva	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
MbB Martinsville	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
PaB Parke	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
PaC Parke	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
PcD*:					
Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Chetwynd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PeA, PeB Pekin	Severe: floods, percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
PeC Pekin	Severe: floods, percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Po Peoga	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, erodes easily.	Severe: ponding.
PrC Princeton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
PrE Princeton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
RcB Ryker	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RcC-------------------- Ryker	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
RcD-------------------- Ryker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Sf--------------------- Steff	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Severe: erodes easily.	Severe: floods.
St--------------------- Stendal	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods.
Sx--------------------- Stonelick	Severe: floods.	Moderate: floods, small stones.	Severe: small stones, floods.	Moderate: floods.	Severe: floods.
TlA-------------------- Tilsit	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: percs slowly, wetness.	Severe: erodes easily.	Moderate: wetness.
TlB-------------------- Tilsit	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
Ua*. Udorthents					
Ud*: Udorthents.					
Pits.					
Wa--------------------- Wakeland	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Severe: erodes easily.	Severe: floods.
WeC-------------------- Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
WmC*: Wellston--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Gilpin----------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Wo--------------------- Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Wr--------------------- Wilbur	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.
ZnC-------------------- Zanesville	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Zo--------------------- Zipp	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Zp: Zipp	Severe: floods, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Zs: Zipp Variant	Severe: floods, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, floods, percs slowly.	Severe: erodes easily.	Severe: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AfB: Alford	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ba: Bartle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BdB: Bedford	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BkF*:										
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Bo: Bonnie	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Bu: Burnside	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CaD: Caneyville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Cb*:										
Caneyville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hagerstown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ChF: Chetwynd	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CoF*:										
Corydon Variant	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Caneyville Variant	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
CrB: Crider	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrC: Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CrD: Crider	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CsC*:										
Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Caneyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CtB*:										
Crider	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CtB*: Urban land.										
CtC*: Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
Cu Cuba	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
EbE*: Ebal	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Hagerstown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
EdD*: Ebal	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
EkB Elkinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EkF. Elkinsville										
GpD Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GrD*: Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Gullied land.										
HaC Hagerstown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HaD Hagerstown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HaE, HbD3 Hagerstown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hc*: Hagerstown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Caneyville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hd Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
HkF: Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
HoA, HoB: Hosmer	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HoC: Hosmer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HtB*:										
Hosmer	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
IvA: Iva	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MbB: Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PaB: Parke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PaC: Parke	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PcD*:										
Parke	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Chetwynd	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PeA, PeB: Pekin	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
PeC: Pekin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Po: Peoga	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
PrC: Princeton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PrE: Princeton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RcB: Ryker	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RcC: Ryker	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RcD: Ryker	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Sf: Steff	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
St: Stendal	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Sx: Stonelick	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
TlA: Tilsit	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
TlB: Tilsit	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ua*. Udorthents										
Ud*: Udorthents.										
Pits.										
Wa: Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
WeC: Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WmC*: Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Wo: Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wr: Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ZnC: Zanesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Zo, Zp: Zipp	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Zs: Zipp Variant	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Fair	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AfB: Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Ba: Bartle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
BdB: Bedford	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
BkF*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
Bo: Bonnie	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
Bu: Burnside	Moderate: large stones, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: large stones, floods.
CaD: Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Cb*:						
Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hagerstown	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
ChF: Chetwynd	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CoF*:						
Corydon Variant	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: low strength, slope, depth to rock.	Severe: slope, thin layer
Caneyville Variant	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CrB: Crider	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
CrC: Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CrD----------------- Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CsC*:						
Crider------------	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Caneyville--------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
CtB*:						
Crider------------	Moderate: too clayey.	Slight---------	Slight---------	Moderate: slope.	Severe: low strength.	Slight.
Urban land.						
CtC*:						
Crider------------	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Urban land.						
Cu----------------- Cuba	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
EbE*:						
Ebal--------------	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: slope, low strength, shrink-swell.	Severe: slope.
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hagerstown--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
EdD*:						
Ebal--------------	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: slope, low strength, shrink-swell.	Severe: slope.
Wellston----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
EkB---------------- Elkinsville	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, frost action.	Slight.
EkF---------------- Elkinsville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
GpD---------------- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GrD*:						
Gilpin-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gullied land.						
HaC--------------- Hagerstown	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
HaD--------------- Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
HaE, HbD3--------- Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hc*:						
Hagerstown-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Caneyville-------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hd---------------- Haymond	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
HkF--------------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
HoA--------------- Hosmer	Moderate: wetness.	Slight---------	Moderate: wetness.	Slight---------	Severe: low strength, frost action.	Slight.
HoB--------------- Hosmer	Moderate: wetness.	Slight---------	Moderate: wetness.	Moderate: slope.	Severe: low strength, frost action.	Slight.
HoC--------------- Hosmer	Moderate: wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
HtB*:						
Hosmer-----------	Moderate: wetness.	Slight---------	Moderate: wetness.	Moderate: slope.	Severe: low strength, frost action.	Slight.
Urban land.						
IvA--------------- Iva	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
MbB--------------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
PaB--------------- Parke	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
PaC--------------- Parke	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PcD*:						
Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Chetwynd	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PeA, PeB Pekin	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action.	Slight.
PeC Pekin	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods, slope.	Severe: frost action.	Moderate: slope.
Po Peoga	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
PrC Princeton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
PrE Princeton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RcB Ryker	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
RcC Ryker	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
RcD Ryker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Sf Steff	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods, frost action.	Severe: floods.
St Stendal	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
Sx Stonelick	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
TlA Tilsit	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
TlB Tilsit	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Moderate: wetness.
Ua*. Udorthents						
Ud*: Udorthents.						
Pits.						

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Wa----------------- Wakeland	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
WeC---------------- Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
WmC*:						
Wellston----------	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
Gilpin------------	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, depth to rock.
Wo----------------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Wr----------------- Wilbur	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
ZnC---------------- Zanesville	Moderate: slope, wetness, depth to rock.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
Zo----------------- Zipp	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding.	Severe: ponding.
Zp----------------- Zipp	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
Zs----------------- Zipp Variant	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, floods, shrink-swell.	Severe: floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AfB----------------- Alford	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Ba------------------ Bartle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BdB----------------- Bedford	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
BkF*: Berks---------------	Severe: depth to rock, slope.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope.	Poor: small stones, slope.
Weikert-------------	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
Bo------------------ Bonnie	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Bu------------------ Burnside	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: small stones.
CaD----------------- Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Cb*: Caneyville----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Hagerstown----------	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
ChF----------------- Chetwynd	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
CoF*: Corydon Variant----	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Caneyville Variant	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CrB: Crider	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: thin layer.
CrC: Crider	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
CrD: Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, thin layer.
CsC*:					
Crider	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
CtB*:					
Crider	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: thin layer.
Urban land.					
CtC*:					
Crider	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
Urban land.					
Cu: Cuba	Severe: floods.	Severe: floods.	Severe: floods, too sandy.	Severe: floods.	Poor: too sandy.
EbE*:					
Ebal	Severe: slope, percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Hagerstown	Severe: slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
EdD*:					
Ebal	Severe: slope, percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EkB: Elkinsville	Slight	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
EkF: Elkinsville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
GpD: Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
GrD*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Gullied land.					
HaC: Hagerstown	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
HaD: Hagerstown	Severe: slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
HaE, HbD3: Hagerstown	Severe: slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Hc*:					
Hagerstown	Severe: slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Hd: Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
HkF: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HoA, HoB: Hosmer	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Slight	Fair: wetness.
HoC: Hosmer	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope.	Moderate: slope.	Fair: slope, wetness.
HtB*:					
Hosmer	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Slight	Fair: wetness.
Urban land.					
IvA: Iva	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MbB: Martinsville	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
PaB: Parke	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
PaC: Parke	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
PcD*:					
Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Chetwynd	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
PeA, PeB: Pekin	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
PeC: Pekin	Severe: wetness, percs slowly.	Severe: floods, slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, wetness.
Po: Peoga	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
PrC: Princeton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope.
PrE: Princeton	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
RcB: Ryker	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
RcC: Ryker	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
RcD: Ryker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sf: Steff	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Fair: too clayey, wetness.
St: Stendal	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Sx: Stonelick	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: seepage.
TlA, TlB: Tilsit	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Moderate: wetness, depth to rock.	Fair: area reclaim, too clayey.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ua*. Udorthents					
Ud*: Udorthents.					
Pits.					
Wa----------------- Wakeland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
WeC---------------- Wellston	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: area reclaim, small stones, slope.
WmC*: Wellston-----------	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: area reclaim, small stones, slope.
Gilpin-------------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
Wo----------------- Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Wr----------------- Wilbur	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: wetness.
ZnC---------------- Zanesville	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: depth to rock, slope, wetness.	Fair: slope, too clayey, area reclaim.
Zo----------------- Zipp	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: ponding, too clayey, hard to pack.
Zp----------------- Zipp	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
Zs----------------- Zipp Variant	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AfB------------------- Alford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ba-------------------- Bartle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
BdB------------------- Bedford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
BkF*:				
Berks-----------------	Poor: slope, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Weikert---------------	Poor: slope, depth to rock.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, thin layer.
Bo-------------------- Bonnie	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Bu-------------------- Burnside	Poor: area reclaim.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim.
CaD------------------- Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Cb*:				
Caneyville------------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Hagerstown------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
ChF------------------- Chetwynd	Poor: slope.	Probable--------------	Probable--------------	Poor: slope.
CoF*:				
Corydon Variant-------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Caneyville Variant----	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
CrB------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
CrC------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
CrD------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CsC*:				
Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CtB*:				
Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Urban land.				
CtC*:				
Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
Urban land.				
Cu Cuba	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
EbE*:				
Ebal	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
EdD*:				
Ebal	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Wellston	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
EkB Elkinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
EkF Elkinsville	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GpD Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GrD*:				
Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Gullied land.				

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HaC: Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
HaD: Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
HaE, HbD3: Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hc*:				
Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Hd: Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
HkF: Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HoA, HoB: Hosmer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HoC: Hosmer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
HtB*:				
Hosmer	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
IvA: Iva	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
MbB: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
PaB: Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
PaC: Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
PcD*:				
Parke	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Chetwynd	Poor: slope.	Probable	Probable	Poor: slope.
PeA, PeB: Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
PeC: Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Po: Peoga	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PrC------------------- Princeton	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
PrE------------------- Princeton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
RcB------------------- Ryker	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
RcC------------------- Ryker	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
RcD------------------- Ryker	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sf-------------------- Steff	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
St-------------------- Stendal	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sx-------------------- Stonelick	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: small stones.
TlA, TlB-------------- Tilsit	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ua*. Udorthents				
Ud*: Udorthents.				
Pits.				
Wa-------------------- Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
WeC------------------- Wellston	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
WmC*: Wellston--------------	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Gilpin---------------	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Wo-------------------- Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wr-------------------- Wilbur	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
ZnC------------------- Zanesville	Fair: area reclaim, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Zo, Zp----------------- Zipp	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Zs--------------------- Zipp Variant	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
AfB----------------- Alford	Moderate: seepage, slope.	Slight----------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Ba----------------- Bartle	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
BdB----------------- Bedford	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
BkF*:						
Berks-------------	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Not needed-----	Depth to rock, large stones, slope.	Depth to rock, large stones, droughty.
Weikert-----------	Severe: depth to rock, slope.	Severe: seepage.	Severe: no water.	Not needed-----	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
Bo----------------- Bonnie	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Floods, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Bu----------------- Burnside	Moderate: seepage, depth to rock.	Severe: large stones.	Moderate: depth to rock, slow refill, deep to water.	Deep to water	Large stones, erodes easily.	Large stones, erodes easily.
CaD----------------- Caneyville	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Cb*:						
Caneyville--------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Hagerstown--------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope-----------	Slope.
ChF----------------- Chetwynd	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope-----------	Slope.
CoF*:						
Corydon Variant----------	Severe: slope, depth to rock.	Severe: thin layer, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Caneyville Variant----------	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
CrB----------------- Crider	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Favorable-------	Favorable.
CrC, CrD----------- Crider	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope.
CsC*:						
Crider------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
CsC*:						
Caneyville	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
CtB*:						
Crider	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
Urban land.						
CtC*:						
Crider	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
Urban land.						
Cu Cuba	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
EbE*:						
Ebal	Severe: slope.	Severe: hard to pack.	Severe: no water.	Not needed	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.
Gilpin	Severe: slope.	Severe: piping.	Severe: no water.	Not needed	Slope, depth to rock.	Slope, depth to rock.
Hagerstown	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
EdD*:						
Ebal	Severe: slope.	Severe: hard to pack.	Severe: no water.	Not needed	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.
Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Gilpin	Severe: slope.	Severe: piping.	Severe: no water.	Not needed	Slope, depth to rock.	Slope, depth to rock.
EkB Elkinsville	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
EkF Elkinsville	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
GpD Gilpin	Severe: slope.	Severe: piping.	Severe: no water.	Not needed	Slope, depth to rock.	Slope, depth to rock.
GrD*:						
Gilpin	Severe: slope.	Severe: piping.	Severe: no water.	Not needed	Slope, depth to rock.	Slope, depth to rock.
Gullied land.						
HaC, HaD, HaE, HbD3 Hagerstown	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Hc*:						
Hagerstown	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Hc*: Caneyville	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Hd Haymond	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
HkF Hickory	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
HoA Hosmer	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, rooting depth.	Erodes easily, rooting depth.
HoB Hosmer	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, rooting depth.	Erodes easily, rooting depth.
HoC Hosmer	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, rooting depth.	Slope, erodes easily, rooting depth.
HtB*: Hosmer	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, rooting depth.	Erodes easily, rooting depth.
Urban land.						
IvA Iva	Moderate: seepage.	Severe: thin layer, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
MbB Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
PaB Parke	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
PaC Parke	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
PcD*: Parke	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Chetwynd	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope.
PeA, PeB Pekin	Moderate: seepage.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness.	Erodes easily, rooting depth.
PeC Pekin	Severe: slope.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Po Peoga	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
PrC, PrE Princeton	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
RcB---------------- Ryker	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
RcC, RcD----------- Ryker	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Sf----------------- Steff	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Floods, frost action.	Erodes easily, wetness.	Erodes easily.
St----------------- Stendal	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Floods, frost action.	Wetness, erodes easily.	Erodes easily, wetness.
Sx----------------- Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy------	Droughty.
TlA---------------- Tilsit	Moderate: depth to rock, seepage.	Severe: piping.	Severe: no water.	Percs slowly---	Erodes easily, wetness.	Erodes easily, rooting depth.
TlB---------------- Tilsit	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Ua*. Udorthents						
Ud*: Udorthents.						
Pits.						
Wa----------------- Wakeland	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Floods, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
WeC---------------- Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
WmC*: Wellston----------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Gilpin------------	Severe: slope.	Severe: piping.	Severe: no water.	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
Wo----------------- Whitaker	Moderate: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
Wr----------------- Wilbur	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
ZnC---------------- Zanesville	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, wetness.
Zo----------------- Zipp	Slight---------	Severe: ponding.	Severe: slow refill.	Percs slowly, ponding.	Ponding, percs slowly.	Wetness, percs slowly.
Zp----------------- Zipp	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, floods.	Wetness, percs slowly.	Wetness, percs slowly.
Zs----------------- Zipp Variant	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, floods.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
AfB---------------- Alford	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	14-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	15-30
	38-70	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
Ba---------------- Bartle	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-90	20-35	5-15
	9-29	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	29-47	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	47-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
BdB--------------- Bedford	0-12	Silt loam--------	CL, ML	A-6, A-4	0	100	100	95-100	85-95	30-40	5-15
	12-20	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	25-45	15-25
	20-48	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	25-45	15-25
	48-80	Silty clay, clay, silty clay loam.	CL, CH	A-7	0-5	90-100	75-95	70-95	65-90	45-55	20-30
BkF*:											
Berks-----------	0-4	Silt loam--------	CL, SM, CL-ML, SC	A-2, A-4	0-10	40-90	35-85	30-80	25-70	25-36	5-10
	4-22	Channery silt loam, very channery silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	22-38	Shaly loam, very shaly loam, very channery silt loam.	GM, GC, SM, SC	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---
Weikert---------	0-6	Shaly silt loam	GM, ML	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	6-15	Shaly silt loam, very shaly silt loam.	GM, GP	A-1, A-2	0-20	15-60	10-45	5-35	5-35	28-36	3-9
	15	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Bo---------------- Bonnie	0-6	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	6-60	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
Bu---------------- Burnside	0-20	Silt loam--------	ML, CL, CL-ML	A-4	0-10	100	100	80-95	75-95	20-35	2-10
	20-44	Channery silt loam, very channery silt loam.	SC, GC, SM, GM	A-2, A-4	10-60	35-80	30-60	30-50	26-45	<20	NP-10
	44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CaD--------------- Caneyville	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	5-24	Silt loam, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	24-35	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Cb*:											
Caneyville------	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	5-24	Cherty silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	24-35	Cherty clay, silty clay.	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Cb*:											
Hagerstown	0-11	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7, A-5	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	11-22	Clay, silty clay loam, loam.	CL, CH, MH	A-7	0-5	90-100	80-100	75-100	55-95	40-65	26-34
	22-44	Clay, silty clay, silty clay loam.	CH, MH, CL, ML	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-70	15-40
	44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ChF Chetwynd	0-6	Silt loam	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	60-95	22-33	4-12
	6-30	Silt loam, clay loam.	SC, CL	A-4, A-6	0	90-100	85-100	70-95	40-75	20-35	8-18
	30-80	Sandy clay loam, loam, gravelly sandy clay loam.	SM-SC, SC, CL-ML, CL	A-2-4, A-2-6, A-4, A-6	0	70-95	65-95	60-90	30-65	20-32	5-15
CoF*:											
Corydon Variant	0-8	Flaggy silt loam	CL, CL-ML, SC, SM-SC	A-4, A-6	10-30	85-100	65-100	55-100	45-90	20-40	4-15
	8-16	Flaggy silt loam, flaggy silty clay loam, very flaggy silty clay loam.	CL, CH	A-7	30-55	90-95	80-90	70-90	55-85	42-70	20-45
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Caneyville Variant	0-3	Channery silt loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	10-30	85-100	65-100	55-100	45-90	20-40	4-15
	3-13	Channery silt loam, cherty silty clay loam.	GC, CL, SC, CL-ML	A-4, A-6	5-30	70-95	50-90	45-90	35-85	20-40	4-15
	13-22	Silty clay	CH, CL	A-7	0-10	90-95	75-90	70-90	60-85	42-70	20-45
	22-30	Flaggy clay, very cherty clay, very channery clay.	CH, CL	A-7	30-55	90-95	80-90	70-90	55-85	42-70	20-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CrB, CrC, CrD Crider	0-9	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	9-33	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	33-67	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
	67	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CsC*:											
Crider	0-12	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	12-40	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	40-60	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
Caneyville	0-5	Silt loam	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	5-16	Silt loam, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	16-38	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
CtB*, CtC*:											
Crider----------	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	9-33	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	33-67	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
	67	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
Cu---------------- Cuba	0-45	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	98-100	90-100	70-90	25-35	3-12
	45-60	Stratified silt loam to fine sand.	CL, ML, CL-ML	A-4	0	100	90-100	75-100	50-85	15-30	2-10
EbE*:											
Ebal------------	0-4	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	80-98	25-40	5-15
	4-8	Channery silt loam, very channery silty clay loam.	CL	A-6, A-7	0-3	60-70	50-70	45-70	40-65	30-45	12-20
	8-19	Channery silty clay, very channery clay.	CL, CH	A-7	3-15	60-70	50-70	45-70	35-65	40-55	20-30
	19-54	Clay-------------	CH	A-7	0-3	95-100	90-100	80-100	70-95	60-75	35-45
	54	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin----------	0-3	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-24	Channery loam, shaly silt loam, very channery loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hagerstown------	0-2	Channery silt loam.	ML, CL, CL-ML	A-4, A-6, A-7, A-5	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	2-36	Clay, clay loam, silty clay loam.	CL, CH, MH	A-7	0-5	90-100	80-100	75-100	55-95	40-65	26-34
	36-44	Clay, silty clay, silty clay loam.	CH, MH, CL, ML	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-70	15-40
	44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
EdD*:											
Ebal------------	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	80-98	25-40	5-15
	8-13	Channery silt loam, channery silty clay loam.	CL	A-6, A-7	0-3	60-70	50-70	45-70	40-65	30-45	12-20
	13-21	Channery silty clay, very channery clay.	CL, CH	A-7	3-15	60-70	50-70	45-70	35-65	40-55	20-30
	21-61	Clay-------------	CH	A-7	0-3	95-100	90-100	80-100	70-95	60-75	35-45
	61-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
Wellston--------	0-12	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	12-29	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	29-50	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
EdD*:											
Gilpin----------	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	6-22	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
EkB, EkF--------- Elkinsville	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	5-15
	7-28	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	85-100	65-90	30-40	8-18
	28-60	Silty clay loam, silt loam, sandy clay loam.	CL	A-4, A-6	0	100	100	80-100	50-90	30-40	8-18
	60-70	Stratified silty clay loam to sandy loam.	CL, CL-ML, ML, SM	A-4, A-6	0	100	100	70-100	45-80	<30	NP-15
GpD------------- Gilpin	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	7-28	Channery silt loam, silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GrD*:											
Gilpin----------	0-3	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-39	Channery silty clay loam, silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gullied land.											
HaC, HaD, HaE---- Hagerstown	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7, A-5	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	7-21	Silty clay, silty clay loam.	CL, CH, MH	A-7	0-5	90-100	80-100	75-100	55-95	40-65	26-34
	21-58	Clay, silty clay, silty clay loam.	CH, MH, CL, ML	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-70	15-40
	58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HbD3------------ Hagerstown	0-6	Silty clay loam	ML, CL, CL-ML	A-4, A-6, A-7, A-5	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	6-16	Clay, silty clay loam.	CL, CH, MH	A-7	0-5	90-100	80-100	75-100	55-95	40-65	26-34
	16-54	Clay, silty clay, cherty clay.	CH, MH, CL, ML	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-70	15-40
	54	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hc*:											
Hagerstown------	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7, A-5	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	8-12	Clay, cherty silt loam.	CL, CH, MH	A-7	0-5	90-100	80-100	75-100	55-95	40-65	26-34
	12-42	Clay, very cherty clay, silty clay loam.	CH, MH, CL, ML	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-70	15-40
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Hc*:											
Caneyville------	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	7-24	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	24-40	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hd--------------- Haymond	0-10	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	10-30	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	30-60	Silt loam--------	ML	A-4	0	95-100	90-100	80-100	65-90	27-36	4-10
HkF-------------- Hickory	0-9	Silt loam, loam	CL-ML, CL	A-6, A-4	0-5	95-100	90-100	90-100	85-95	20-35	5-15
	9-41	Clay loam--------	CL	A-6, A-7	0-5	100	90-100	80-95	75-90	30-50	15-30
	41-60	Clay loam, sandy loam, loam.	CL-ML, CL	A-4, A-6	0-5	85-100	85-95	80-95	60-80	20-40	5-20
HoA, HoB, HoC---- Hosmer	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	11-23	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	23-63	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	63-72	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
HtB*:											
Hosmer----------	0-11	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	11-23	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	23-63	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
	63-72	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-35	5-15
Urban land.											
IvA-------------- Iva	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	12-47	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	47-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
MbB-------------- Martinsville	0-16	Loam-------------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	16-40	Clay loam, loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	40-67	Sandy loam, clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	67-70	Stratified sand to sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
PaB, PaC--------- Parke	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	9-29	Silty clay loam	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	10-25
	29-80	Sandy clay loam, loam, gravelly clay loam.	SC	A-2, A-6	0-3	90-100	85-95	75-90	30-50	25-35	10-15
PcD*:											
Parke-----------	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	14-26	Silty clay loam	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	10-25
	26-80	Sandy clay loam, loam, clay loam.	SC	A-2, A-6	0-3	90-100	85-95	75-90	30-50	25-35	10-15
Chetwynd--------	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	60-95	22-33	4-12
	7-32	Clay loam, sandy clay loam.	SC, CL	A-4, A-6	0	90-100	85-100	70-95	40-75	20-35	8-18
	32-80	Sandy clay loam, loam, gravelly sandy clay loam.	SM-SC, SC, CL-ML, CL	A-2-4, A-2-6, A-4, A-6	0	70-95	65-95	60-90	30-65	20-32	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
PeA, PeB, PeC---- Pekin	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-100	20-35	5-15
	5-32	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	32-54	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	88-98	65-90	25-35	5-15
	54-60	Stratified fine sandy loam to silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-85	20-30	5-15
Po--------------- Peoga	0-15	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	15-80	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	20-30
PrC, PrE--------- Princeton	0-7	Loam-------------	SM, SC, ML, CL	A-4, A-2-4	0	100	100	60-85	30-55	<25	NP-10
	7-46	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	100	100	70-90	35-70	25-35	10-15
	46-68	Fine sandy loam, loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	100	100	60-90	30-70	15-25	5-15
	68-80	Stratified fine sand to silt.	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	100	65-90	20-55	<20	NP-5
RcB, RcC, RcD---- Ryker	0-15	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	80-95	25-35	5-15
	15-30	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	75-95	30-45	15-25
	30-60	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	85-98	80-98	75-95	60-85	30-45	15-25
	60-78	Silty clay loam, silty clay, clay.	CL, CH	A-7, A-6	0	80-95	75-95	75-95	60-85	40-60	20-30
	78	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sf--------------- Steff	0-10	Silt loam--------	ML	A-4	0	95-100	90-100	80-100	55-95	<35	NP-10
	10-49	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	70-95	20-40	3-20
	49-60	Silt loam, gravelly loam, very fine sandy loam.	ML, CL-ML, SM, GM	A-4, A-2, A-1	0-10	50-100	40-100	35-95	20-90	<35	NP-10
St--------------- Stendal	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
	9-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
Sx--------------- Stonelick	0-11	Silt loam--------	ML, CL, SM, CL-ML	A-4	0	85-100	70-100	60-95	45-90	20-32	2-10
	11-60	Stratified loam to loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1-B	0	85-100	70-95	40-60	5-40	<15	NP
TlA, TlB--------- Tilsit	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	90-100	85-100	75-100	60-100	20-35	NP-10
	9-26	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	65-100	25-40	5-20
	26-48	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	85-100	75-100	65-100	25-45	5-25
	48-58	Silt loam, channery silty clay loam, silty clay.	CL, CH, CL-ML	A-4, A-6, A-7	0-30	70-100	65-85	60-85	55-80	25-60	5-35
	58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ua*. Udorthents											

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ud*: Udorthents.											
Pits.											
Wa----------------- Wakeland	0-9	Silt loam---------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	9-60	Silt loam---------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
WeC--------------- Wellston	0-12	Silt loam---------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	12-29	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	29-50	Silty clay loam, loam, channery silt loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WmC*: Wellston---------	0-4	Silt loam---------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	4-23	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	23-46	Silty clay loam, loam, channery silty clay loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	46	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin-----------	0-5	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	5-27	Channery silt loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wo----------------- Whitaker	0-8	Loam--------------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
	8-60	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	60-80	Stratified coarse sand to clay.	CL, SC, ML, SM	A-4	0	98-100	98-100	60-85	40-60	15-25	3-9
Wr----------------- Wilbur	0-10	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	10-60	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
ZnC--------------- Zanesville	0-6	Silt loam---------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	6-28	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	28-39	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	39-60	Silty clay, clay loam, channery sandy clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-B	0-10	65-100	50-95	40-95	20-85	20-40	2-20
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Zo, Zp------------ Zipp	0-8	Silty clay loam	CL, CH	A-7, A-6	0	100	100	95-100	90-95	35-55	20-30
	8-40	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	40-60	Silty clay--------	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35
Zs----------------- Zipp Variant	0-10	Silt loam---------	ML, CL-ML, CL	A-4, A-6	0	100	100	90-100	75-95	25-36	5-15
	10-19	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	30-40	15-20
	19-70	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	70-80	Stratified silt loam to silt.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
AfB---------------- Alford	0-14	18-27	1.25-1.40	0.6-2.0	0.22-0.24	3.6-7.3	<2	Low--------	0.37	5	5	1-3
	14-38	22-30	1.35-1.50	0.6-2.0	0.18-0.20	3.6-6.0	<2	Moderate	0.37			
	38-70	8-20	1.30-1.45	0.6-2.0	0.20-0.22	3.6-7.3	<2	Low--------	0.37			
Ba---------------- Bartle	0-9	15-26	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low--------	0.43	4	5	1-3
	9-29	22-35	1.40-1.60	0.6-2.0	0.20-0.22	3.6-5.5	<2	Low--------	0.43			
	29-47	22-35	1.60-1.80	<0.06	0.06-0.08	3.6-5.5	<2	Low--------	0.43			
	47-60	22-35	1.40-1.60	0.2-0.6	0.15-0.18	5.1-7.3	<2	Low--------	0.43			
BdB---------------- Bedford	0-12	10-16	1.30-1.45	0.6-2.0	0.22-0.24	3.6-7.3	<2	Low--------	0.43	4	5	.5-1
	12-20	27-32	1.30-1.45	0.6-2.0	0.18-0.20	3.6-5.0	<2	Moderate	0.43			
	20-48	28-35	1.50-1.70	<0.06	0.06-0.08	3.6-5.0	<2	Moderate	0.43			
	48-80	35-55	1.30-1.50	0.2-0.6	0.06-0.08	3.6-5.0	<2	Moderate	0.32			
BkF*:												
Berks------------	0-4	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-7.3	<2	Low--------	0.24	3	---	1-4
	4-22	5-20	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	<2	Low--------	0.17			
	22-38	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	<2	Low--------	0.17			
	38	---	---	---	---	3.6-6.5	---	-----------	----			
Weikert----------	0-6	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-6.0	<2	Low--------	0.28	2	---	1-3
	6-15	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	<2	Low--------	0.28			
	15	---	---	---	---	---	---	-----------	----			
Bo---------------- Bonnie	0-6	18-25	1.20-1.40	0.6-2.0	0.22-0.24	5.1-7.3	<2	Low--------	0.43	5	6	1-3
	6-60	18-25	1.40-1.60	0.2-0.6	0.20-0.22	4.5-5.5	<2	Low--------	0.43			
Bu---------------- Burnside	0-20	20-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-6.0	<2	Low--------	0.37	4	5	.5-2
	20-44	15-25	1.40-1.60	0.6-2.0	0.10-0.16	4.5-5.5	<2	Low--------	0.37			
	44	---	---	---	---	---	---	-----------	----			
CaD---------------- Caneyville	0-5	10-25	---	0.6-2.0	0.15-0.22	4.5-7.3	<2	Low--------	0.43	3	---	2-4
	5-24	36-60	---	0.2-0.6	0.12-0.18	4.5-6.0	<2	Moderate	0.28			
	24-35	40-60	---	0.2-0.6	0.12-0.18	5.6-7.8	<2	Moderate	0.28			
	35	---	---	---	---	---	---	-----------	----			
Cb*:												
Caneyville-------	0-5	10-25	---	0.6-2.0	0.15-0.22	4.5-7.3	<2	Low--------	0.43	3	---	2-4
	5-24	36-60	---	0.2-0.6	0.12-0.18	4.5-6.0	<2	Moderate	0.28			
	24-35	40-60	---	0.2-0.6	0.12-0.18	5.6-7.8	<2	Moderate	0.28			
	35	---	---	---	---	---	---	-----------	----			
Hagerstown-------	0-11	15-35	1.20-1.40	0.6-6.0	0.16-0.24	4.5-5.5	<2	Low--------	0.32	4	---	1-5
	11-22	23-60	1.20-1.60	0.6-2.0	0.10-0.24	4.5-7.3	<2	Moderate	0.28			
	22-44	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	<2	Moderate	0.28			
	44	---	---	---	---	---	---	-----------	----			
ChF---------------- Chetwynd	0-6	12-24	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low--------	0.32	5	5	1-3
	6-30	22-35	1.40-1.60	0.6-2.0	0.13-0.17	4.5-5.5	<2	Moderate	0.32			
	30-80	20-30	1.35-1.60	0.6-2.0	0.11-0.17	5.1-6.0	<2	Low--------	0.32			
CoF*:												
Corydon Variant---------	0-8	15-25	1.35-1.50	0.6-2.0	0.12-0.18	6.1-7.3	<2	Low--------	0.24	2	5	1-3
	8-16	15-38	1.40-1.60	0.2-2.0	0.05-0.12	6.1-7.3	<2	Low--------	0.24			
	16	---	---	---	---	---	---	-----------	---			
Caneyville Variant---------	0-3	8-25	1.35-1.50	0.6-2.0	0.12-0.18	5.1-7.3	<2	Low--------	0.28	4	6	1-3
	3-13	15-40	1.35-1.50	0.6-2.0	0.12-0.18	4.5-5.5	<2	Low--------	0.28			
	13-22	40-55	1.45-1.60	0.2-0.6	0.12-0.18	4.5-5.5	<2	Moderate	0.28			
	22-30	50-80	1.45-1.60	0.06-0.2	0.05-0.08	6.1-7.8	<2	Moderate	0.28			
	30	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
CrB, CrC, CrD------ Crider	0-9	---	---	0.6-2.0	0.19-0.23	5.1-6.5	<2	Low--------	0.32	4	---	.5-2
	9-33	---	---	0.6-2.0	0.18-0.23	5.1-6.5	<2	Low--------	0.28			
	33-67	---	---	0.6-2.0	0.12-0.18	5.1-6.0	<2	Moderate	0.28			
	67	---	---	---	---	---	---	-----------	-----			
CsC*:												
Crider-----------	0-12	---	---	0.6-2.0	0.19-0.23	5.1-6.5	<2	Low--------	0.32	4	---	.5-2
	12-40	---	---	0.6-2.0	0.18-0.23	5.1-6.5	<2	Low--------	0.28			
	40-60	---	---	0.6-2.0	0.12-0.18	5.1-6.0	<2	Moderate	0.28			
Caneyville-------	0-5	10-25	---	0.6-2.0	0.15-0.22	4.5-6.0	<2	Low--------	0.43	3	---	2-4
	5-16	36-60	---	0.2-0.6	0.12-0.18	4.5-6.0	<2	Moderate	0.28			
	16-38	40-60	---	0.2-0.6	0.12-0.18	5.6-7.8	<2	Moderate	0.28			
	38	---	---	---	---	---	---	-----------	-----			
CtB*, CtC*:												
Crider-----------	0-9	---	---	0.6-2.0	0.19-0.23	5.1-6.5	<2	Low--------	0.32	4	---	.5-2.0
	9-33	---	---	0.6-2.0	0.18-0.23	5.1-6.5	<2	Low--------	0.28			
	33-67	---	---	0.6-2.0	0.12-0.18	5.1-6.0	<2	Moderate	0.28			
	67	---	---	---	---	---	---	-----------	-----			
Urban land.												
Cu---------------- Cuba	0-45	18-25	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	<2	Low--------	0.37	5	5	1-3
	45-60	14-20	1.45-1.65	0.6-2.0	0.19-0.21	4.5-5.0	<2	Low--------	0.37			
EbE*:												
Ebal-------------	0-4	20-28	1.35-1.50	0.6-2.0	0.22-0.24	4.5-6.0	<2	Low--------	0.37	3	5	.5-2
	4-8	20-30	1.40-1.60	0.6-2.0	0.12-0.17	4.5-6.0	<2	Moderate	0.28			
	8-19	38-50	1.45-1.65	0.2-0.6	0.06-0.09	4.5-6.0	<2	Moderate	0.28			
	19-54	55-70	1.55-1.75	<0.06	0.07-0.10	4.5-6.0	<2	High-------	0.28			
	54	---	---	---	---	---	---	-----------	-----			
Gilpin-----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low--------	0.32	3	---	1-4
	3-24	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	<2	Low--------	0.28			
	24	---	---	---	---	---	---	-----------	-----			
Hagerstown-------	0-2	15-35	1.20-1.40	0.6-6.0	0.16-0.24	4.5-5.5	<2	Low--------	0.32	4	---	1-4
	2-36	23-60	1.20-1.60	0.6-2.0	0.10-0.24	4.5-7.3	<2	Moderate	0.28			
	36-44	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	<2	Moderate	0.28			
	44	---	---	---	---	---	---	-----------	-----			
EdD*:												
Ebal-------------	0-8	20-28	1.35-1.50	0.6-2.0	0.22-0.24	4.5-6.0	<2	Low--------	0.37	3	5	.5-2
	8-13	20-30	1.40-1.60	0.6-2.0	0.12-0.17	4.5-6.0	<2	Moderate	0.28			
	13-21	38-50	1.45-1.65	0.2-0.6	0.06-0.09	4.5-6.0	<2	Moderate	0.28			
	21-61	55-70	1.55-1.75	<0.06	0.07-0.10	4.5-6.0	<2	High-------	0.28			
	61-80	---	---	---	---	---	---	-----------	-----			
Wellston---------	0-12	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	<2	Low--------	0.37	4	6	1-3
	12-29	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	<2	Low--------	0.37			
	29-50	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	<2	Low--------	0.37			
	50	---	---	---	---	---	---	-----------	-----			
Gilpin-----------	0-6	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low--------	0.32	3	---	1-4
	6-22	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	<2	Low--------	0.28			
	22	---	---	---	---	---	---	-----------	-----			
EkB, EkF---------- Elkinsville	0-7	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.37	5	5	.5-2
	7-28	22-30	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.0	<2	Moderate	0.37			
	28-60	16-30	1.45-1.65	0.6-2.0	0.15-0.20	4.5-5.5	<2	Moderate	0.37			
	60-70	20-34	1.40-1.60	0.6-2.0	0.17-0.21	4.5-6.0	<2	Low--------	0.37			
GpD--------------- Gilpin	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low--------	0.32	3	---	.5-2
	7-28	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	<2	Low--------	0.28			
	28	---	---	---	---	---	---	-----------	-----			
GrD*:												
Gilpin-----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low--------	0.32	3	---	.5-2
	3-39	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	<2	Low--------	0.28			
	39	---	---	---	---	---	---	-----------	-----			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
GrD*:												
Gullied land.												
HaC, HaD, HaE---- Hagerstown	0-7	15-35	1.20-1.40	0.6-6.0	0.16-0.24	4.5-7.3	<2	Low--------	0.32	4	---	.5-2
	7-21	23-60	1.20-1.60	0.6-2.0	0.10-0.24	4.5-7.3	<2	Moderate	0.28			
	21-58	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	<2	Moderate	0.28			
HbD3------------- Hagerstown	0-6	15-35	1.20-1.40	0.6-6.0	0.16-0.24	4.5-7.3	<2	Low--------	0.32	4	---	.5-2
	6-16	23-60	1.20-1.60	0.6-2.0	0.10-0.24	4.5-7.3	<2	Moderate	0.28			
	16-54	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	<2	Moderate	0.28			
Hc*:												
Hagerstown-------	0-8	15-35	1.20-1.40	0.6-6.0	0.16-0.24	4.5-7.3	<2	Low--------	0.32	4	---	.5-2
	8-12	23-60	1.20-1.60	0.6-2.0	0.10-0.24	4.5-7.3	<2	Moderate	0.28			
	12-42	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	<2	Moderate	0.28			
Caneyville-------	0-7	10-25	---	0.6-2.0	0.15-0.22	4.5-7.3	<2	Low--------	0.43	3	---	2-4
	7-24	36-60	---	0.2-0.6	0.12-0.18	4.5-6.0	<2	Moderate	0.28			
	24-40	40-60	---	0.2-0.6	0.12-0.18	5.6-7.8	<2	Moderate	0.28			
	40	---	---	---	---	---	---	-----------	-----			
Hd---------------- Haymond	0-10	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.37	5	5	1-3
	10-30	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low--------	0.37			
	30-60	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low--------	0.37			
HkF--------------- Hickory	0-9	19-25	1.45-1.65	0.6-2.0	0.20-0.22	4.5-6.5	<2	Low--------	0.37	5	6	1-2
	9-41	27-35	1.60-1.80	0.6-2.0	0.15-0.19	3.6-5.5	<2	Moderate	0.37			
	41-60	15-22	1.70-1.90	0.6-2.0	0.11-0.19	5.1-8.4	<2	Low--------	0.37			
HoA, HoB, HoC----- Hosmer	0-11	10-17	1.20-1.40	0.6-2.0	0.20-0.24	4.5-7.3	<2	Low--------	0.43	4	5	1-2
	11-23	18-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-7.3	<2	Low--------	0.43			
	23-63	18-27	1.60-1.70	<0.06	0.06-0.08	4.5-5.0	<2	Low--------	0.43			
	63-72	10-18	1.30-1.50	0.2-0.6	0.06-0.08	4.5-6.0	<2	Low--------	0.43			
HtB*:												
Hosmer-----------	0-11	10-17	1.20-1.40	0.6-2.0	0.20-0.24	4.5-7.3	<2	Low--------	0.43	4	5	1-2
	11-23	18-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-7.3	<2	Low--------	0.43			
	23-63	18-27	1.60-1.70	<0.06	0.06-0.08	4.5-5.0	<2	Low--------	0.43			
	63-72	10-18	1.30-1.50	0.2-0.6	0.06-0.08	4.5-6.0	<2	Low--------	0.43			
Urban land.												
IvA--------------- Iva	0-12	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	<2	Low--------	0.43	4	5	1-3
	12-47	22-30	1.35-1.55	0.06-0.2	0.18-0.20	5.1-6.5	<2	Moderate	0.43			
	47-60	10-20	1.35-1.55	0.6-2.0	0.20-0.22	5.6-6.5	<2	Low--------	0.43			
MbB--------------- Martinsville	0-16	8-17	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	<2	Low--------	0.37	5	5	1-3
	16-40	18-30	1.40-1.60	0.6-2.0	0.17-0.20	4.5-6.0	<2	Moderate	0.37			
	40-67	10-25	1.40-1.60	0.6-2.0	0.12-0.14	4.5-6.5	<2	Low--------	0.24			
	67-70	3-23	1.50-1.70	0.6-2.0	0.19-0.21	6.1-8.4	<2	Low--------	0.24			
PaB, PaC---------- Parke	0-9	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.5	<2	Low--------	0.37	5	5	.5-2
	9-29	27-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-5.0	<2	Moderate	0.37			
	29-80	20-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	<2	Low--------	0.28			
PcD*:												
Parke------------	0-14	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.5	<2	Low--------	0.37	5	5	.5-2
	14-26	27-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-5.0	<2	Moderate	0.37			
	26-80	20-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	<2	Low--------	0.28			
Chetwynd---------	0-7	12-24	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low--------	0.32	5	5	1-3
	7-32	22-35	1.40-1.60	0.6-2.0	0.13-0.17	4.5-5.5	<2	Moderate	0.32			
	32-80	20-30	1.35-1.60	0.6-2.0	0.11-0.17	5.1-6.0	<2	Low--------	0.32			
PeA, PeB, PeC----- Pekin	0-5	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.43	4	5	1-3
	5-32	27-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	<2	Low--------	0.43			
	32-54	22-30	1.60-1.80	<0.06	0.06-0.08	4.5-6.0	<2	Low--------	0.43			
	54-60	20-34	1.40-1.60	0.6-2.0	0.06-0.08	4.5-7.3	<2	Low--------	0.43			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Po-----------------	0-15	15-26	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	<2	Low--------	0.43	4	5	1-3
Peoga	15-80	22-34	1.40-1.60	0.06-0.2	0.18-0.20	4.5-6.5	<2	Moderate	0.43			
PrC, PrE-----------	0-7	12-20	1.35-1.50	0.6-2.0	0.13-0.18	5.6-7.3	<2	Low--------	0.24	5-4	3	.5-2
Princeton	7-46	18-25	1.40-1.55	0.6-2.0	0.16-0.18	5.1-7.3	<2	Low--------	0.32			
	46-68	8-18	1.40-1.55	2.0-6.0	0.12-0.14	5.1-7.3	<2	Low--------	0.32			
	68-80	4-10	1.45-1.60	2.0-6.0	0.06-0.08	5.6-8.4	<2	Low--------	0.17			
RcB, RcC, RcD-----	0-15	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-7.3	<2	Low--------	0.37	5	5	1-4
Ryker	15-30	20-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-7.3	<2	Moderate	0.37			
	30-60	20-35	1.45-1.65	0.6-2.0	0.15-0.20	4.5-6.0	<2	Moderate	0.37			
	60-78	35-50	1.45-1.65	0.6-2.0	0.09-0.20	4.5-6.0	<2	Moderate	0.37			
	78	---	---	---	---	---	---	-----------	----			
Sf-----------------	0-10	12-25	---	0.6-2.0	0.15-0.23	4.5-7.3	<2	Low--------	0.43	5	---	1-2
Steff	10-49	12-34	---	0.6-2.0	0.18-0.23	4.5-5.5	<2	Low--------	0.43			
	49-60	10-25	---	0.6-6.0	0.08-0.21	4.5-5.5	<2	Low--------	0.43			
St-----------------	0-9	18-35	1.30-1.45	0.6-2.0	0.22-0.24	4.5-6.5	<2	Low--------	0.37	5	5	1-3
Stendal	9-60	18-35	1.45-1.65	0.6-2.0	0.20-0.22	4.5-5.5	<2	Low--------	0.37			
Sx-----------------	0-11	10-22	1.20-1.45	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low--------	0.24	5	5	1-3
Stonelick	11-60	5-18	1.20-1.55	2.0-6.0	0.05-0.11	7.4-8.4	<2	Low--------	0.24			
TlA, TlB-----------	0-9	10-25	---	0.6-2.0	0.16-0.22	3.6-5.5	<2	Low--------	0.43	3	---	1-3
Tilsit	9-26	18-35	---	0.6-2.0	0.16-0.22	3.6-5.5	<2	Low--------	0.43			
	26-48	18-35	---	0.06-0.2	0.08-0.12	3.6-5.5	<2	Low--------	0.43			
	48-58	10-50	---	0.06-0.6	0.08-0.12	3.6-5.5	<2	Low--------	0.43			
	58	---	---	---	---	---	---	-----------	----			
Ua*. Udorthents												
Ud*: Udorthents.												
Pits.												
Wa-----------------	0-9	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.8	<2	Low--------	0.37	5	5	1-3
Wakeland	9-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low--------	0.37			
WeC----------------	0-12	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	<2	Low--------	0.37	4	6	1-3
Wellston	12-29	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	<2	Low--------	0.37			
	29-50	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	<2	Low--------	0.37			
	50	---	---	---	---	---	---	-----------	----			
WmC*:												
Wellston----------	0-4	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	<2	Low--------	0.37	4	6	1-3
	4-23	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	<2	Low--------	0.37			
	23-46	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	<2	Low--------	0.37			
	46	---	---	---	---	---	---	-----------	----			
Gilpin------------	0-5	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low--------	0.32	3	---	1-4
	5-27	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	<2	Low--------	0.28			
	27	---	---	---	---	---	---	-----------	----			
Wo-----------------	0-8	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low--------	0.37	5	5	1-3
Whitaker	8-60	18-30	1.40-1.60	0.6-2.0	0.15-0.19	4.5-6.0	<2	Moderate	0.37			
	60-80	3-18	1.50-1.70	0.6-6.0	0.19-0.21	4.5-6.0	<2	Low--------	0.37			
Wr-----------------	0-10	10-17	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.37	5	5	1-3
Wilbur	10-60	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low--------	0.37			
ZnC----------------	0-6	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-7.3	<2	Low--------	0.37	3	---	1-2
Zanesville	6-28	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-6.0	<2	Low--------	0.37			
	28-39	18-33	1.50-1.75	0.06-0.6	0.08-0.12	4.5-5.5	<2	Low--------	0.37			
	39-60	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	<2	Low--------	0.28			
	60	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Zo, Zp----------- Zipp	0-8	30-45	1.40-1.55	0.2-2.0	0.12-0.21	6.1-7.3	<2	High-------	0.28	5	4	1-3
	8-40	40-55	1.55-1.70	<0.2	0.11-0.13	6.1-7.3	<2	High-------	0.28			
	40-60	35-50	1.55-1.70	<0.2	0.08-0.10	6.6-8.4	<2	High-------	0.28			
Zs--------------- Zipp Variant	0-10	20-35	1.35-1.50	0.6-2.0	0.21-0.24	6.1-7.3	<2	Low--------	0.37	3	5	.5-2
	10-19	32-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-7.3	<2	Moderate	0.43			
	19-70	35-50	1.45-1.60	<0.2	0.11-0.20	5.1-7.8	<2	High-------	0.43			
	70-80	12-30	1.40-1.55	0.6-2.0	0.20-0.22	6.6-7.8	<2	Low--------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AfB: Alford	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
Ba: Bartle	D	None	---	---	1.0-2.0	Perched	Jan-Apr	>60	---	High	High	High.
BdB: Bedford	C	None	---	---	2.0-4.0	Perched	Mar-Apr	>60	---	High	High	High.
BkF*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
Bo: Bonnie	C/D	Frequent	Long	Mar-Jun	0-1.0	Apparent	Mar-Jun	>60	---	High	High	High.
Bu: Burnside	B	Occasional	Brief	Mar-Jun	3.0-5.0	Apparent	Feb-Jun	40-54	Hard	Moderate	Low	High.
CaD: Caneyville	C	None	---	---	>6.0	---	---	20-40	Hard	---	High	Moderate.
Cb*:												
Caneyville	C	None	---	---	>6.0	---	---	20-40	Hard	---	High	Moderate.
Hagerstown	C	None	---	---	>6.0	---	---	>40	Hard	Moderate	Moderate	Low.
ChF: Chetwynd	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
CoF*:												
Corydon Variant	C	None	---	---	>6.0	---	---	10-20	Hard	Moderate	High	Low.
Caneyville Variant	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Low.
CrB, CrC, CrD: Crider	B	None	---	---	>6.0	---	---	>60	Hard	---	Moderate	Moderate.
CsC*:												
Crider	B	None	---	---	>6.0	---	---	>60	Hard	---	Moderate	Moderate.
Caneyville	C	None	---	---	>6.0	---	---	20-40	Hard	---	High	Moderate.
CtB*, CtC*:												
Crider	B	None	---	---	>6.0	---	---	>60	Hard	---	Moderate	Moderate.
Urban land.												

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Cu----------------- Cuba	B	Frequent----	Brief-----	Jan-May	>6.0	---	---	>60	---	High-----	Low-------	High.
EbE*:												
Ebal-------------	B	None---------	---	---	>6.0	---	---	50-80	Soft	Moderate	High-----	High.
Gilpin-----------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low-------	High.
Hagerstown-------	C	None---------	---	---	>6.0	---	---	>40	Hard	Moderate	Moderate	Low.
EdD*:												
Ebal-------------	B	None---------	---	---	>6.0	---	---	50-80	Soft	Moderate	High-----	High.
Wellston---------	B	None---------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Gilpin-----------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low-------	High.
EkB--------------- Elkinsville	B	Rare---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
EkF--------------- Elkinsville	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
GpD--------------- Gilpin	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low-------	High.
GrD*:												
Gilpin-----------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low-------	High.
Gullied land.												
HaC, HaD, HaE, HbD3------------- Hagerstown	C	None---------	---	---	>6.0	---	---	>40	Hard	Moderate	Moderate	Low.
Hc*:												
Hagerstown-------	C	None---------	---	---	>6.0	---	---	>40	Hard	Moderate	Moderate	Low.
Caneyville-------	C	None---------	---	---	>6.0	---	---	20-40	Hard	---	High-----	Moderate.
Hd---------------- Haymond	B	Frequent----	Brief-----	Jan-May	>6.0	---	---	>60	---	High-----	Low-------	Low.
HkF--------------- Hickory	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
HoA, HoB, HoC----- Hosmer	C	None---------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High-----	Moderate	High.
HtB*:												
Hosmer-----------	C	None---------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High-----	Moderate	High.
Urban land.												

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
IvA: Iva	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
MbB: Martinsville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
PaB, PaC: Parke	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
PcD*:												
Parke	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
Chetwynd	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
PeA, PeB, PeC: Pekin	C	Rare	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High	Moderate	High.
Po: Peoga	C	None	---	---	0.-1.0	Apparent	Jan-May	>60	---	High	High	High.
PrC, PrE: Princeton	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
RcB, RcC, RcD: Ryker	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
Sf: Steff	C	Frequent	Brief	Jan-May	1.5-3.0	Apparent	Dec-Apr	>60	---	High	Moderate	High.
St: Stendal	C	Frequent	Brief	Jan-May	1.0-3.0	Apparent	Jan-May	>60	---	High	High	High.
Sx: Stonelick	B	Frequent	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low	Low.
TlA, TlB: Tilsit	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>40	Hard	---	High	High.
Ua*. Udorthents												
Ud*:												
Udorthents.												
Pits.												
Wa: Wakeland	B/D	Frequent	Brief	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
WeC: Wellston	B	None	---	---	>6.0	---	---	>40	Hard	High	Moderate	High.
WmC*:												
Wellston	B	None	---	---	>6.0	---	---	>40	Hard	High	Moderate	High.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
WmC*:												
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
Wo---------------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Wr---------------- Wilbur	C	Frequent----	Brief-----	Jan-May	3.0-6.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	Moderate.
ZnC--------------- Zanesville	C	None--------	---	---	2.0-3.0	Perched	Dec-Apr	>40	Hard	---	Moderate	High.
Zo---------------- Zipp	C/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High-----	Low.
Zp---------------- Zipp	C/D	Frequent----	Brief-----	Dec-May	0-1.0	Apparent	Dec-May	>60	---	Moderate	High-----	Low.
Zs---------------- Zipp Variant	C	Frequent----	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	Moderate	High-----	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
*Alford	Fine-silty, mixed, mesic Typic Hapludalfs
Bartle	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Bedford	Fine-silty, mixed, mesic Typic Fragiudults
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bonnie	Fine-silty, mixed, acid, mesic Typic Fluvaquents
Burnside	Loamy-skeletal, mixed, acid, mesic Typic Udifluvents
Caneyville	Fine, mixed, mesic Typic Hapludalfs
Caneyville Variant	Clayey-skeletal, mixed, mesic Typic Hapludalfs
Chetwynd	Fine-loamy, mixed, mesic Typic Hapludults
Corydon Variant	Clayey-skeletal, mixed, mesic Lithic Argiudolls
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Cuba	Fine-silty, mixed, mesic Fluventic Dystrochrepts
Ebal	Fine, mixed, mesic Ultic Hapludalfs
Elkinsville	Fine-silty, mixed, mesic Ultic Hapludalfs
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hagerstown	Fine, mixed, mesic Typic Hapludalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Hosmer	Fine-silty, mixed, mesic Typic Fragiudalfs
Iva	Fine-silty, mixed, mesic Aeric Ochraqualfs
*Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Parke	Fine-silty, mixed, mesic Ultic Hapludalfs
Pekin	Fine-silty, mixed, mesic Aquic Fragiudalfs
Peoga	Fine-silty, mixed, mesic Typic Ochraqualfs
Princeton	Fine-loamy, mixed, mesic Typic Hapludalfs
Ryker	Fine-silty, mixed, mesic Typic Paleudalfs
Steff	Fine-silty, mixed, mesic Fluvaquentic Dystrochrepts
Stendal	Fine-silty, mixed, acid, mesic Aeric Fluvaquents
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Tilsit	Fine-silty, mixed, mesic Typic Fragiudults
Udorthents	Loamy, mixed, mesic Typic Udorthents
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
*Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Zanesville	Fine-silty, mixed, mesic Typic Fragiudalfs
Zipp	Fine, mixed, nonacid, mesic Typic Haplaquepts
Zipp Variant	Fine, mixed, nonacid, mesic Aeric Haplaquepts

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

☆U.S. GOVERNMENT PRINTING OFFICE : 1981—328—684/99

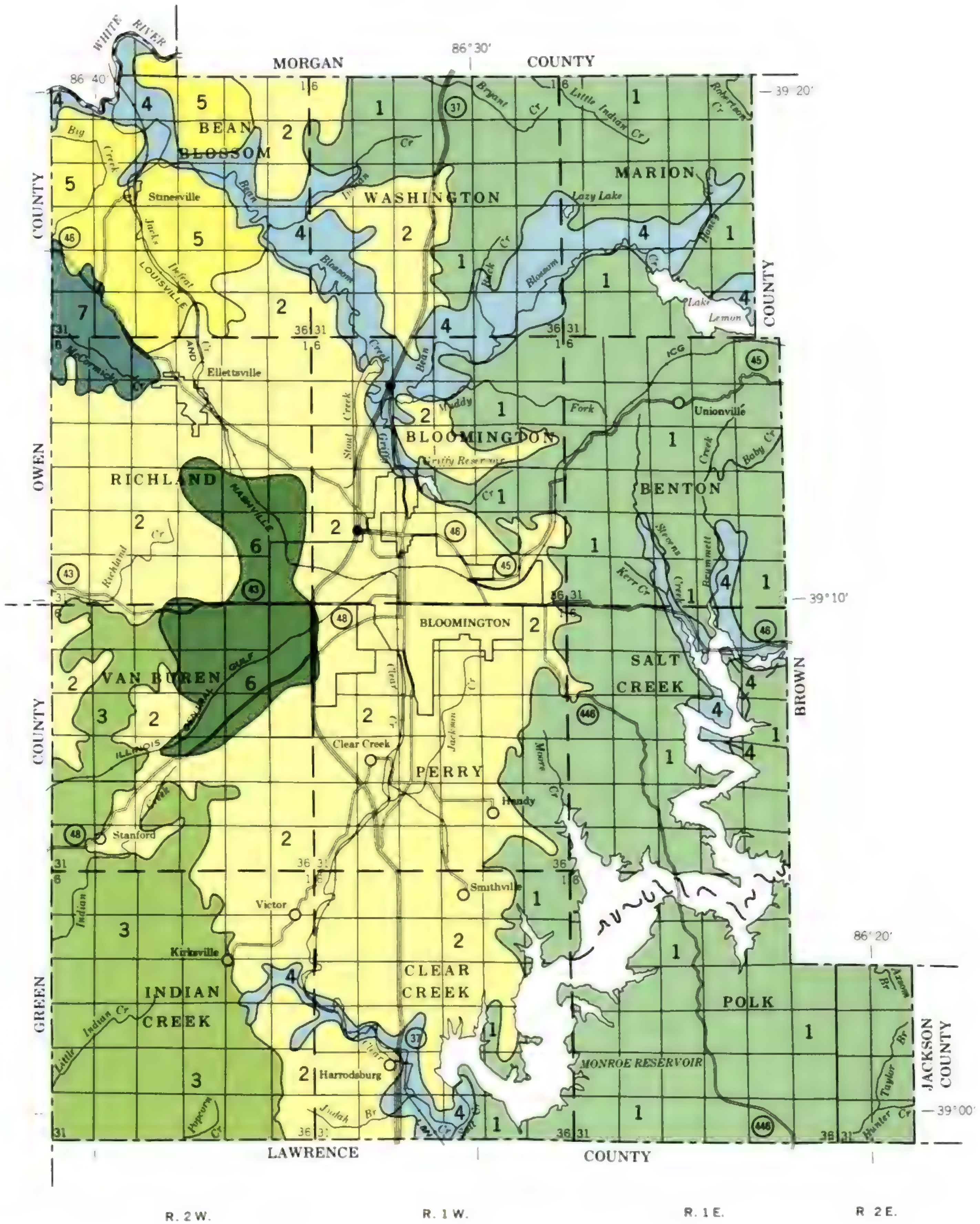
NRCS Accessibility Statement

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
INDIANA DEPARTMENT OF NATURAL RESOURCES,
SOIL AND WATER CONSERVATION COMMITTEE

GENERAL SOIL MAP

MONROE COUNTY, INDIANA

Scale 1:190,080



SOIL LEGEND

1	Berks-Weikert: Moderately deep and shallow, steep and very steep, well drained soils formed in residuum from sandstone, siltstone, and shale; on uplands
2	Crider-Caneyville: Deep and moderately deep, gently sloping to strongly sloping, well drained soils formed in loess and residuum from limestone; on uplands
3	Ebal-Gilpin-Tilsit: Deep and moderately deep, nearly level to moderately steep, moderately well drained and well drained soils formed in loess, colluvium, and residuum from shale, sandstone, and siltstone; on uplands
4	Haymond-Stendal: Deep, nearly level, well drained and somewhat poorly drained soils formed in alluvium; on flood plains
5	Ryker-Hickory: Deep, gently sloping to very steep, well drained soils formed in loess, glacial till, and residuum from limestone; on uplands
6	Hosmer-Crider: Deep, nearly level to moderately sloping, well drained and moderately well drained soils formed in loess and residuum from limestone, sandstone, siltstone, and shale; on uplands
7	Peoga-Bartle: Deep, nearly level, poorly drained and somewhat poorly drained soils formed in loess and lakebed sediments or in old alluvium; on uplands

Compiled 1980

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

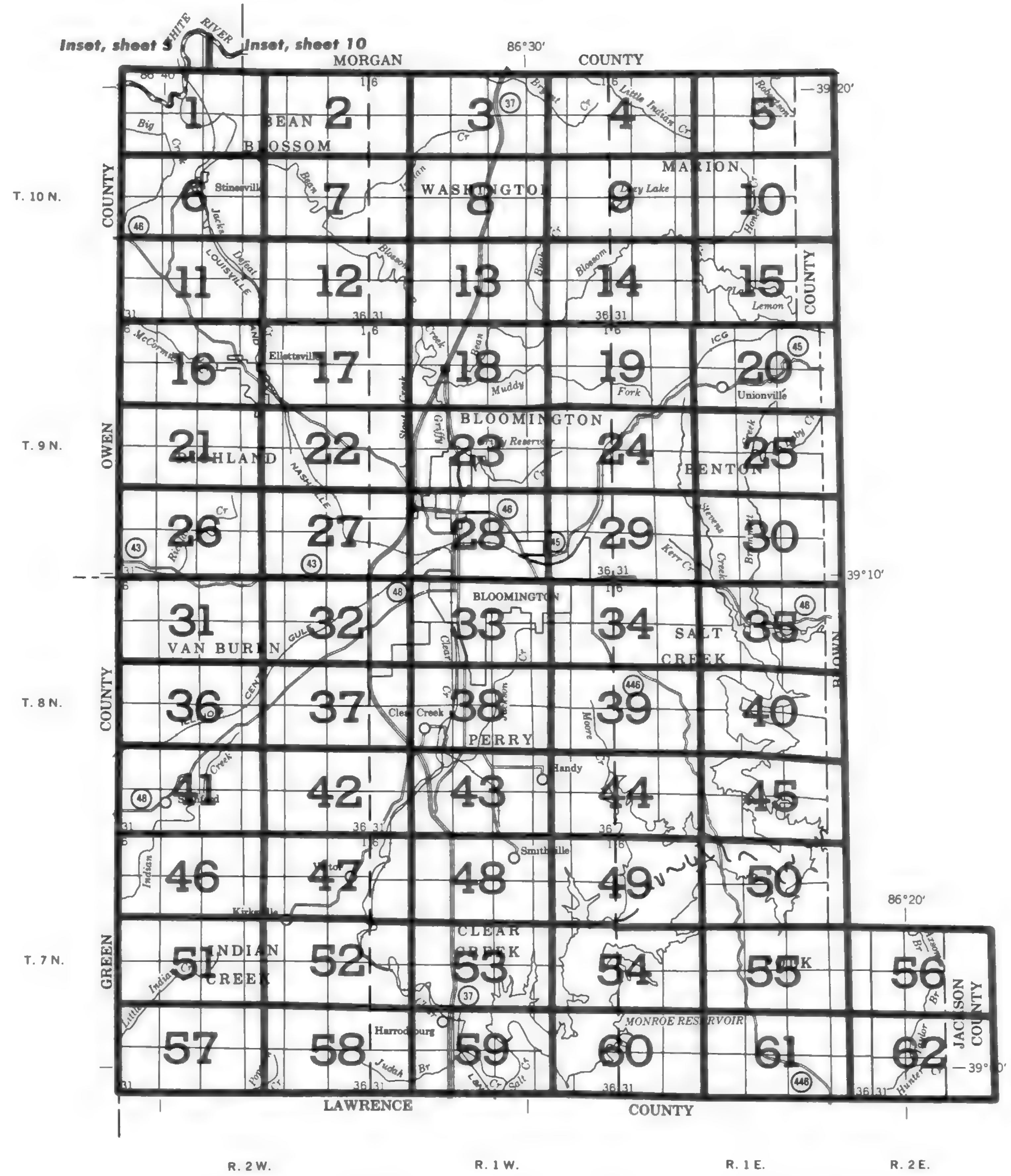
INDEX TO MAP SHEETS
MONROE COUNTY, INDIANA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

N



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and numbers. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 3 indicates that the soil is severely eroded.

SYMBOL	NAME
AfB	Alford silt loam, 2 to 6 percent slopes
Ba	Bartle silt loam
BdB	Bedford silt loam, 2 to 6 percent slopes
BkF	Berks–Weikert complex, 25 to 75 percent slopes
Bo	Bonnie silt loam
Bu	Burnside silt loam
CaD	Caneyville silt loam, 12 to 18 percent slopes
Cb	Caneyville–Hagerstown silt loams, karst
ChF	Chetwynd silt loam, 25 to 70 percent slopes
CoF	Corydon Variant–Caneyville Variant complex, 25 to 70 percent slopes
CrB	Crider silt loam, 2 to 6 percent slopes
CrC	Crider silt loam, 6 to 12 percent slopes
CrD	Crider silt loam, 12 to 18 percent slopes
CsC	Crider–Caneyville silt loams, 6 to 12 percent slopes
CtB	Crider–Urban land complex, 2 to 6 percent slopes
CtC	Crider–Urban land complex, 6 to 12 percent slopes
Cu	Cuba silt loam
EbE	Ebal–Gilpin–Hagerstown silt loams, 18 to 25 percent slopes
EdD	Ebal–Wellston–Gilpin silt loams, 12 to 18 percent slopes
EkB	Elkinsville silt loam, 2 to 6 percent slopes
EkF	Elkinsville silt loam, upland, 20 to 40 percent slopes
GpD	Gilpin silt loam, 12 to 18 percent slopes
GrD	Gilpin–Gullied land complex, 12 to 22 percent slopes
HaC	Hagerstown silt loam, 6 to 12 percent slopes
HaD	Hagerstown silt loam, 12 to 18 percent slopes
HaE	Hagerstown silt loam, 18 to 25 percent slopes
HbD3	Hagerstown silty clay loam, 12 to 22 percent slopes, severely eroded
Hc	Hagerstown–Caneyville silt loams, karst
Hd	Haymond silt loam
HkF	Hickory silt loam, 25 to 70 percent slopes
HoA	Hosmer silt loam, 0 to 2 percent slopes
HoB	Hosmer silt loam, 2 to 6 percent slopes
HoC	Hosmer silt loam, 6 to 12 percent slopes
HtB	Hosmer–Urban land complex, 2 to 12 percent slopes
IvA	Iva silt loam, 0 to 3 percent slopes
MbB	Martinsville loam, 2 to 6 percent slopes
PaB	Parke silt loam, 2 to 6 percent slopes
PaC	Parke silt loam, 6 to 12 percent slopes
PcD	Parke–Chetwynd silt loams, 12 to 18 percent slopes
PeA	Pekin silt loam, 0 to 2 percent slopes
PeB	Pekin silt loam, 2 to 6 percent slopes
PeC	Pekin silt loam, 6 to 12 percent slopes
Po	Peoga silt loam
PrC	Princeton loam, 4 to 10 percent slopes
PrE	Princeton loam, 18 to 25 percent slopes
RcB	Ryker silt loam, 2 to 6 percent slopes
RcC	Ryker silt loam, 6 to 12 percent slopes
RcD	Ryker silt loam, 12 to 18 percent slopes
Sf	Steff silt loam
St	Stendal silt loam
Sx	Stonelick silt loam
TlA	Tilsit silt loam, 0 to 2 percent slopes
TlB	Tilsit silt loam, 2 to 6 percent slopes
Ua	Udorthents, loamy
Ud	Udorthents–Pits complex
Wa	Wakeland silt loam
WeC	Wellston silt loam, 6 to 12 percent slopes
WmC	Wellston–Gilpin silt loams, 6 to 20 percent slopes
Wo	Whitaker loam
Wr	Wilbur silt loam
ZnC	Zanesville silt loam, 6 to 12 percent slopes
Zo	Zipp silty clay loam
Zp	Zipp silty clay loam, frequently flooded
Zs	Zipp Variant silt loam

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool — Davis Airstrip; FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate — 79
- Federal — 410
- State — 52
- County, farm or ranch — 378

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water; w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — GAS
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water; w
- Intermittent — int; i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CeA; FoB2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

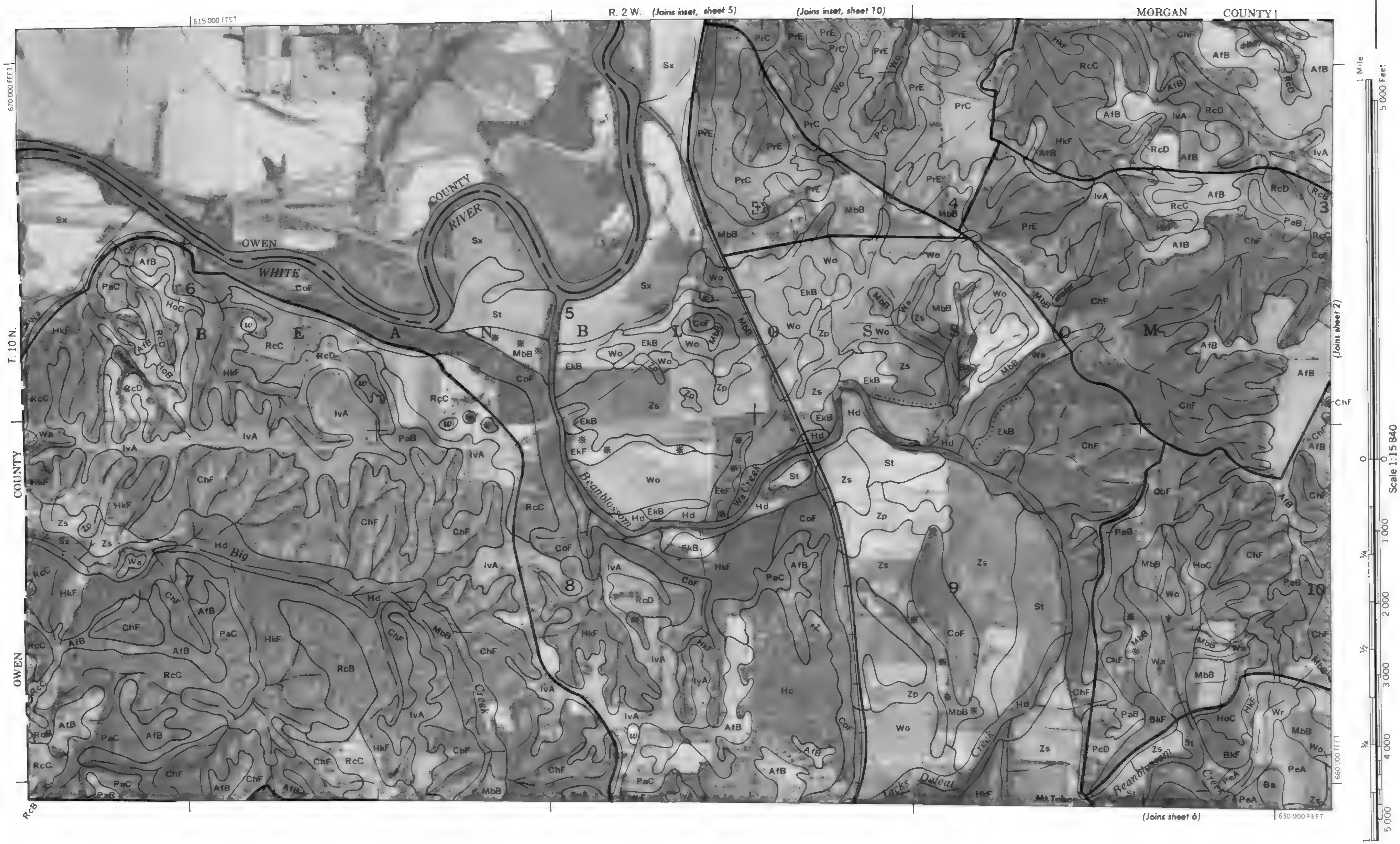
DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



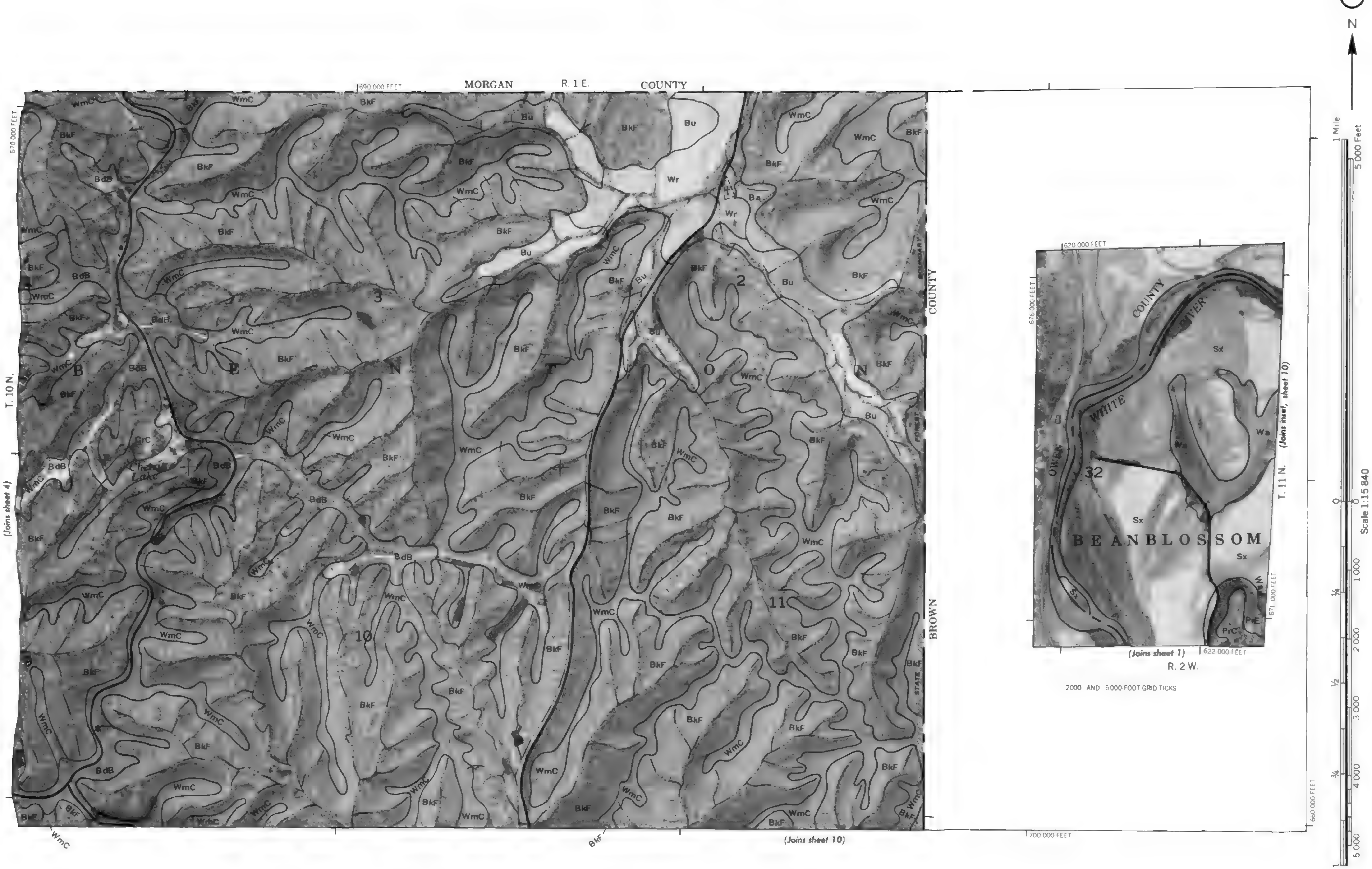
This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

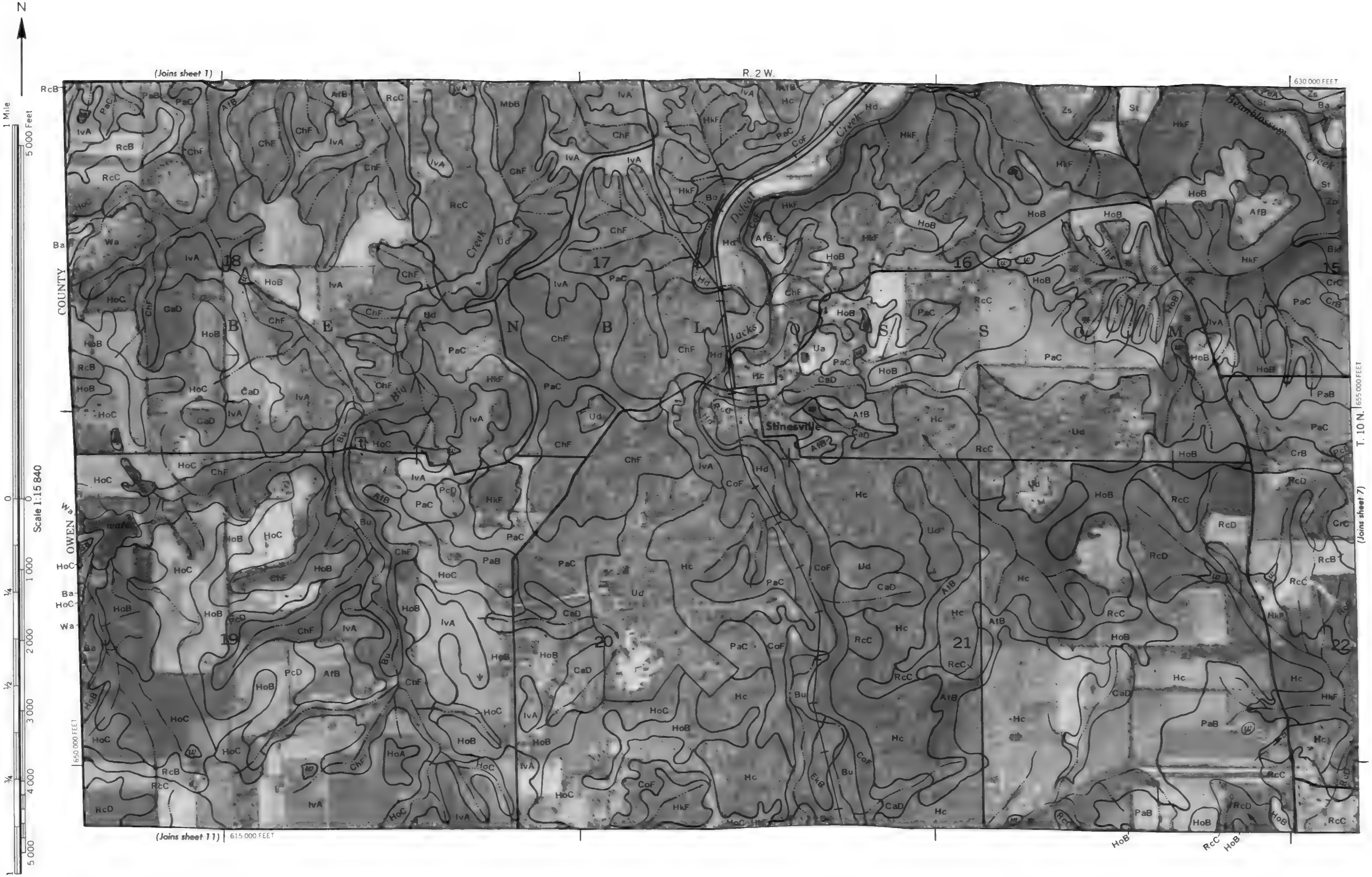
MONROE COUNTY, INDIANA — SHEET NUMBER 4

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



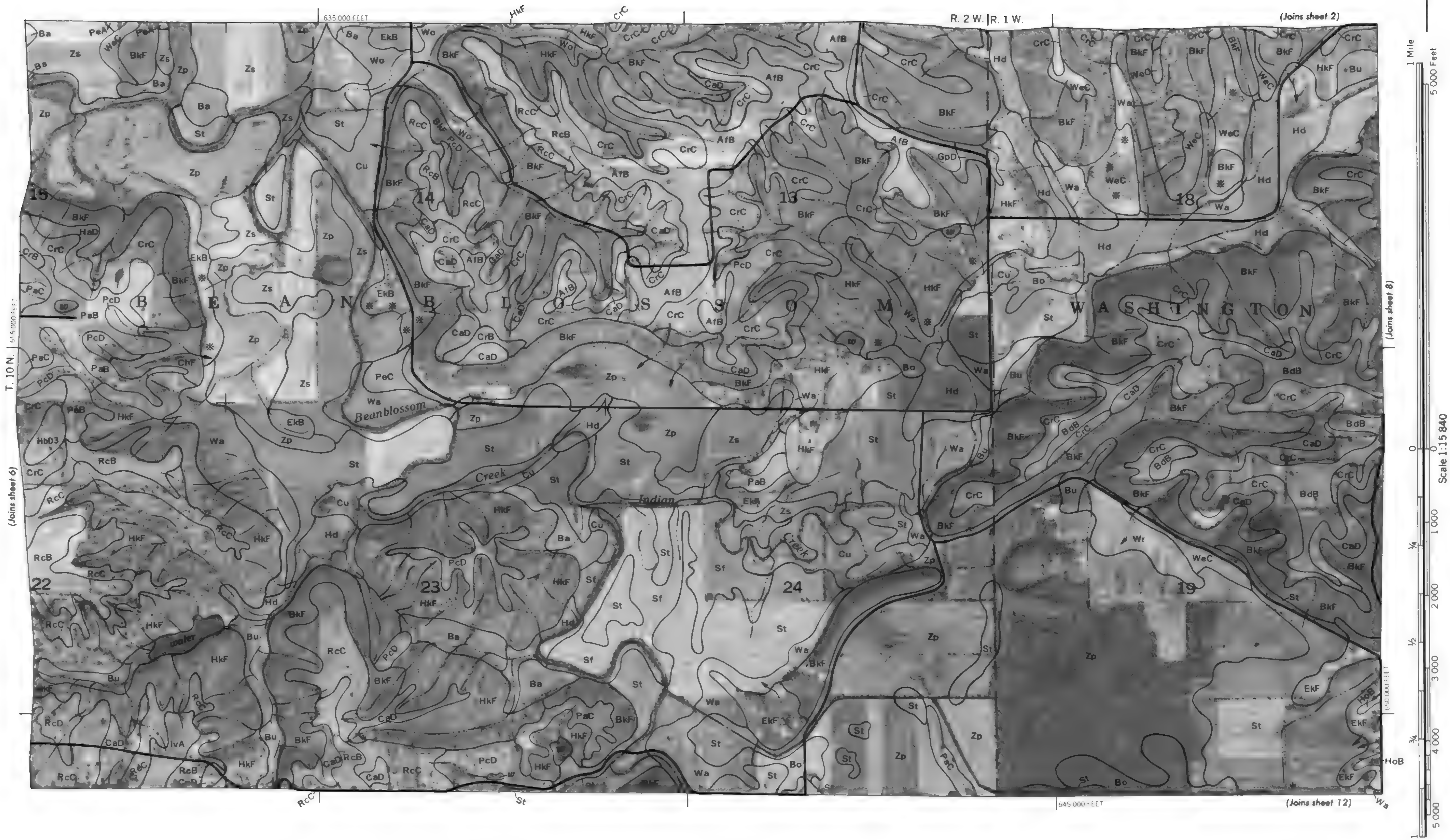
6



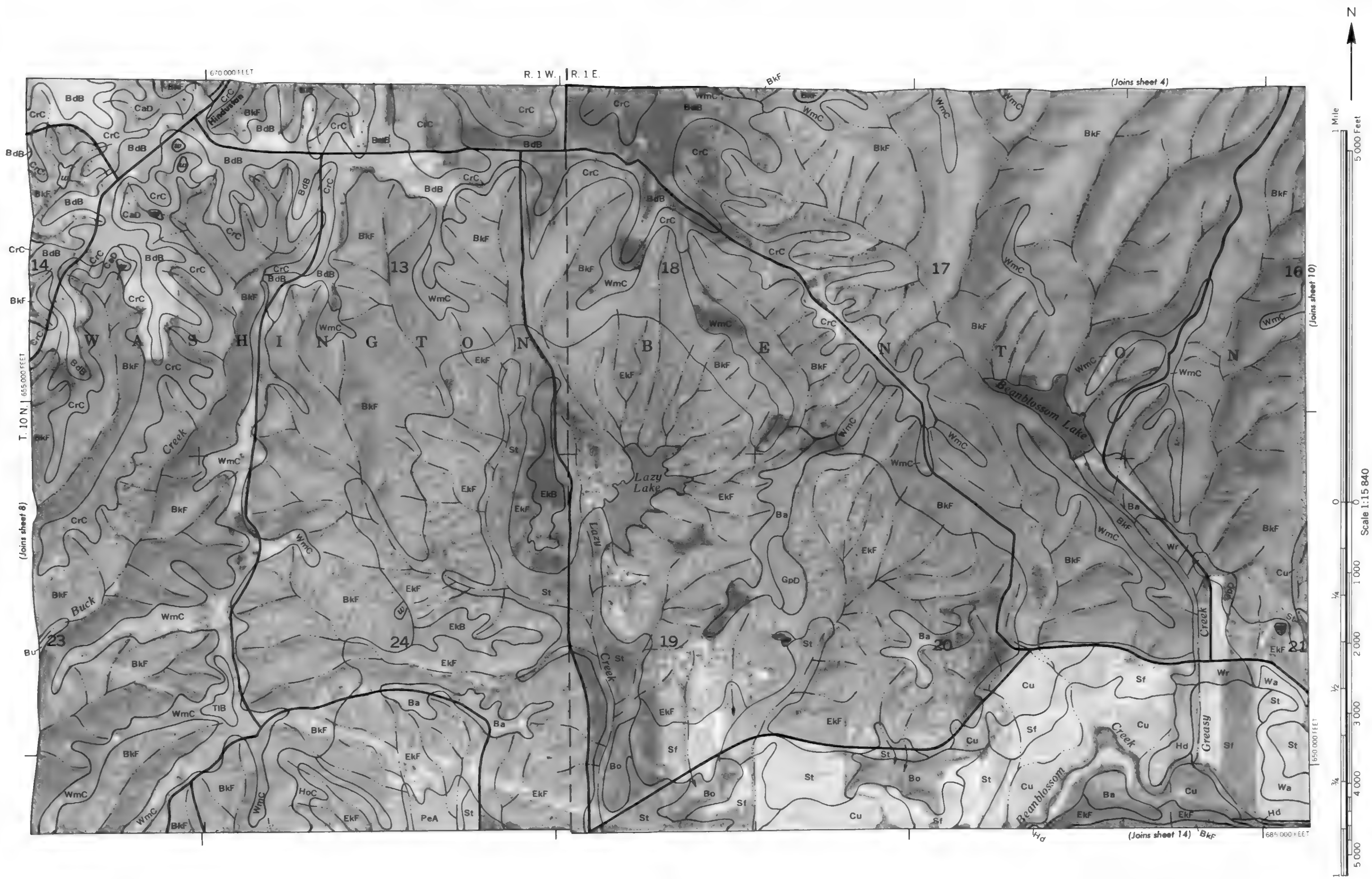
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

7

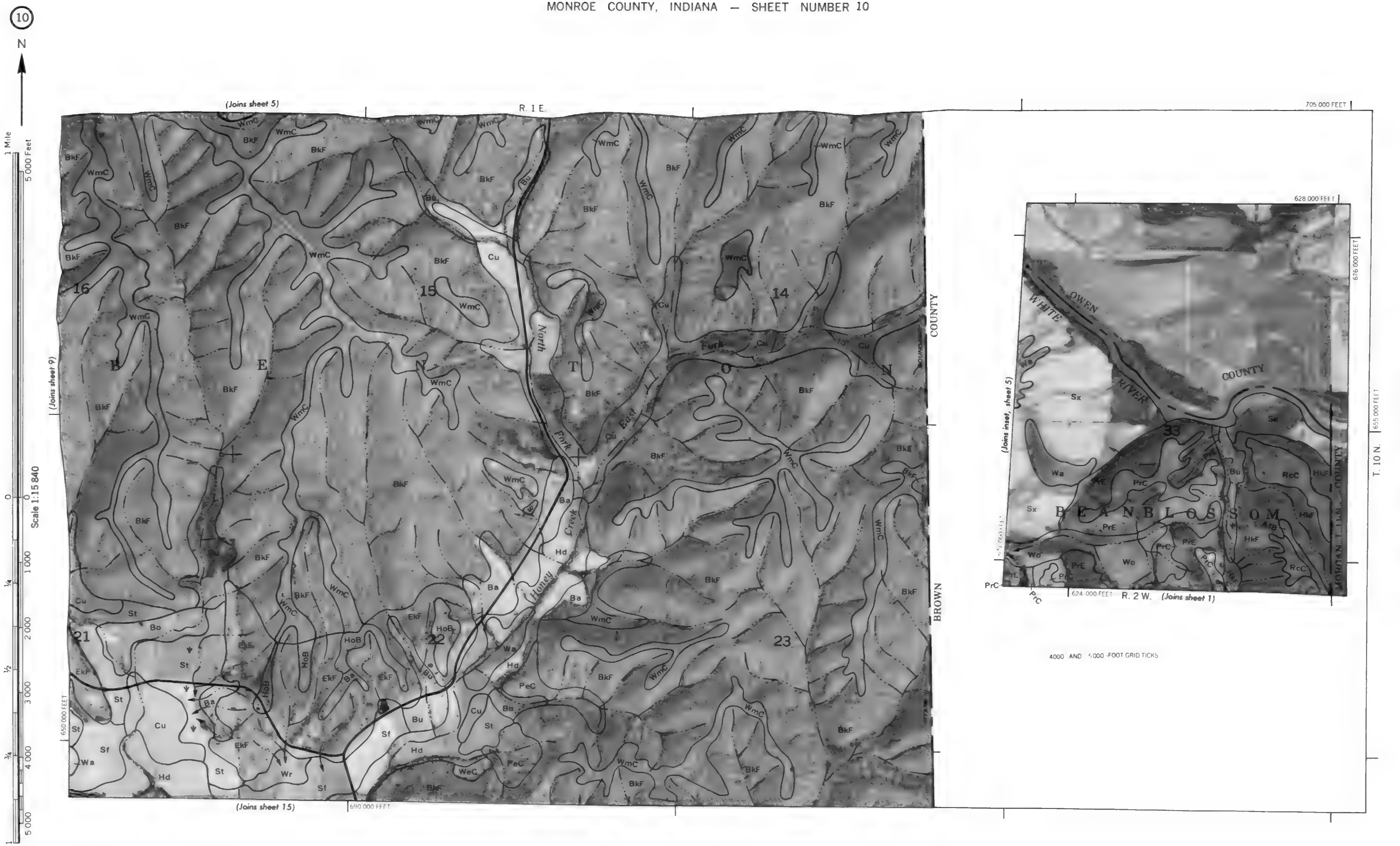
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.




8
N
(Joins sheet 3)
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 13)
R. 1 W.
T. 10 N.
665 000 FEET
650 000 FEET
655 000 FEET
Indian Creek
Buck
W A S H I N G T O N
17
16
15
14
20
21
22
23
Scale 1:15 840
1 Mile
5 000 Feet



This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

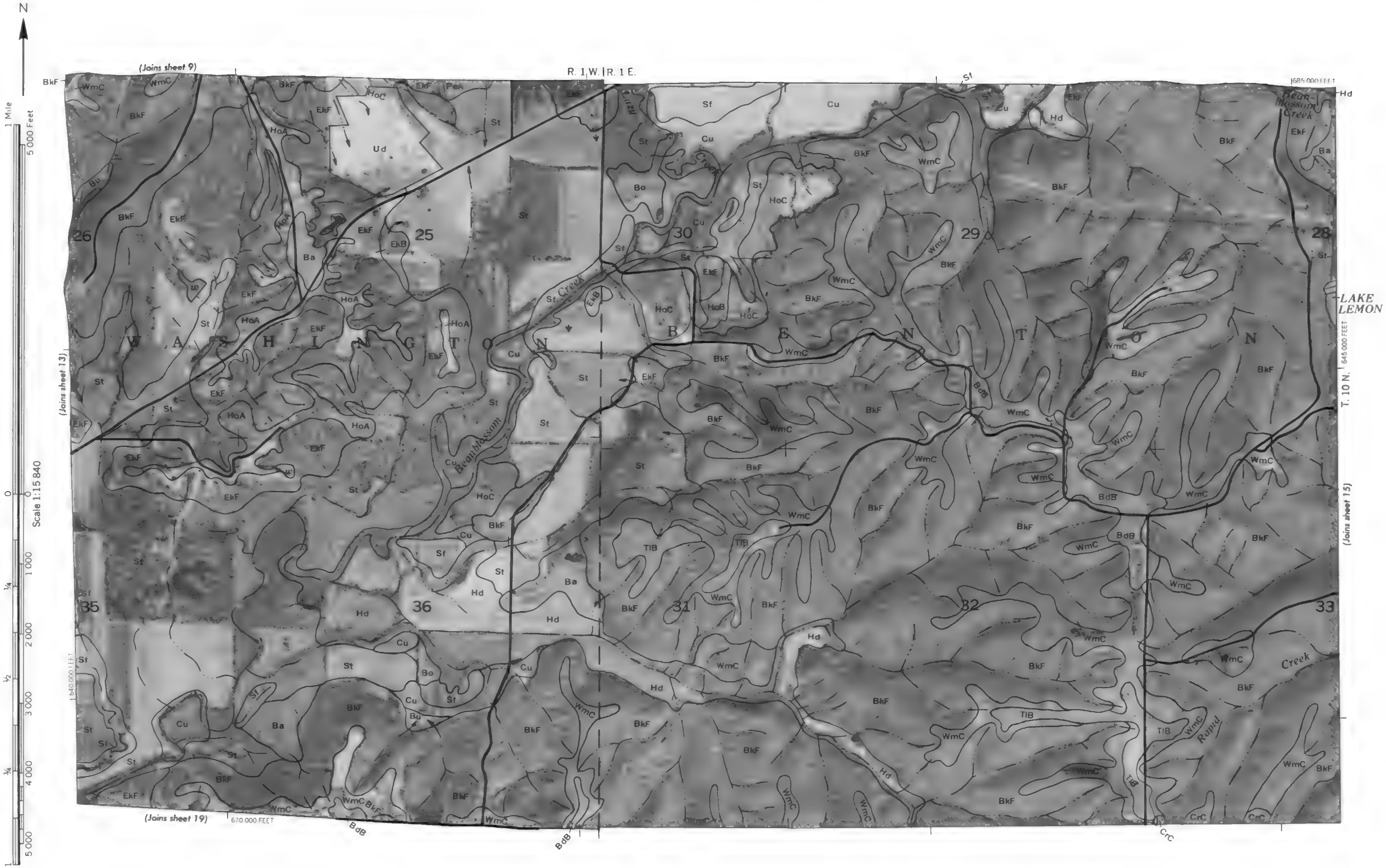

10
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 5)
R. 1 E.
705 000 FEET
628 000 FEET
676 000 FEET
655 000 FEET
(Joins sheet 9)
(Joins sheet 15)
690 000 FEET
650 000 FEET
624 000 FEET
B E N T O N
North Fork
East Fork
Honey Creek
BROWN
COUNTY
WHITE RIVER
OWEN COUNTY
B E A N B L O S S O M
(Joins inset, sheet 5)
R. 2 W.
(Joins sheet 1)
T. 10 N.
4000 AND 5000-FOOT GRID TICKS

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


13
N
R. 1 W.
(Joins sheet 8)
(Joins sheet 12)
(Joins sheet 14)
(Joins sheet 18)
T. 10 N.
650 000 FEET
645 000 FEET
640 000 FEET
665 000 FEET
W A S H I N G T O N
Modesto
Beanblossom Creek
Beanblossom Creek
Beanblossom Creek
Buck Creek
29
28
27
26
32
33
34
35
37
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾

MONROE COUNTY, INDIANA — SHEET NUMBER 14



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MONROE COUNTY, INDIANA — SHEET NUMBER 16

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

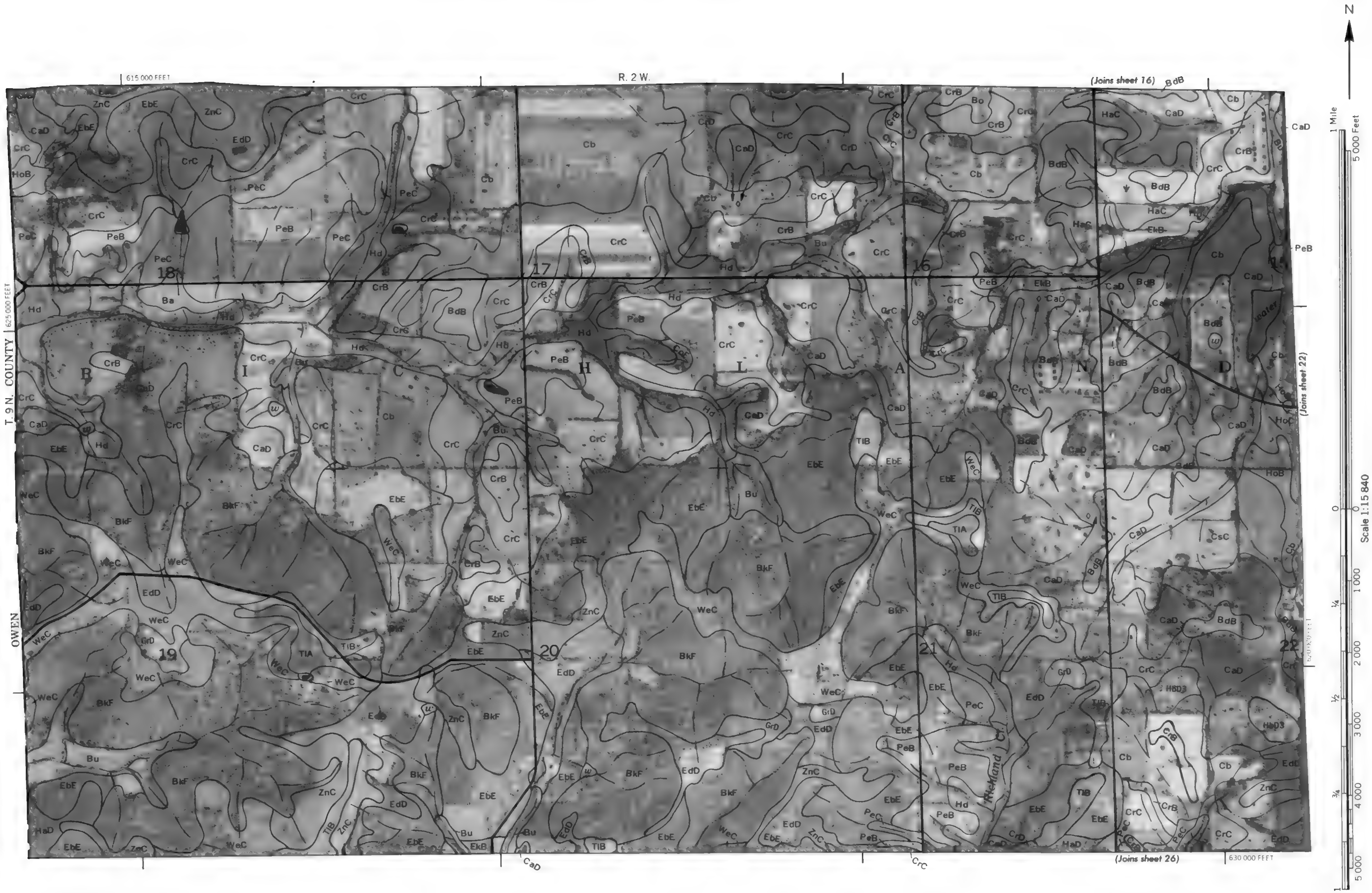
MONROE COUNTY, INDIANA — SHEET NUMBER 18

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.


19
N
(Joins sheet 14)
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 24)
R. 1 W.
R. 1 E.
T. 9 N.
670 000 FEET
635 000 FEET
630 000 FEET
685 000 FEET
B L O O M I N G T O N
B E N T O N
Muddy
Fork
NATIONAL FOREST BOUNDARY
1
2
5
6
7
8
11
12
45
Sf
St
EkF
EkB
BdB
BkF
WmC
CrC
CaD
PeB
Bu
Bo
TlB
Wr
Wa
Hd
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(21)



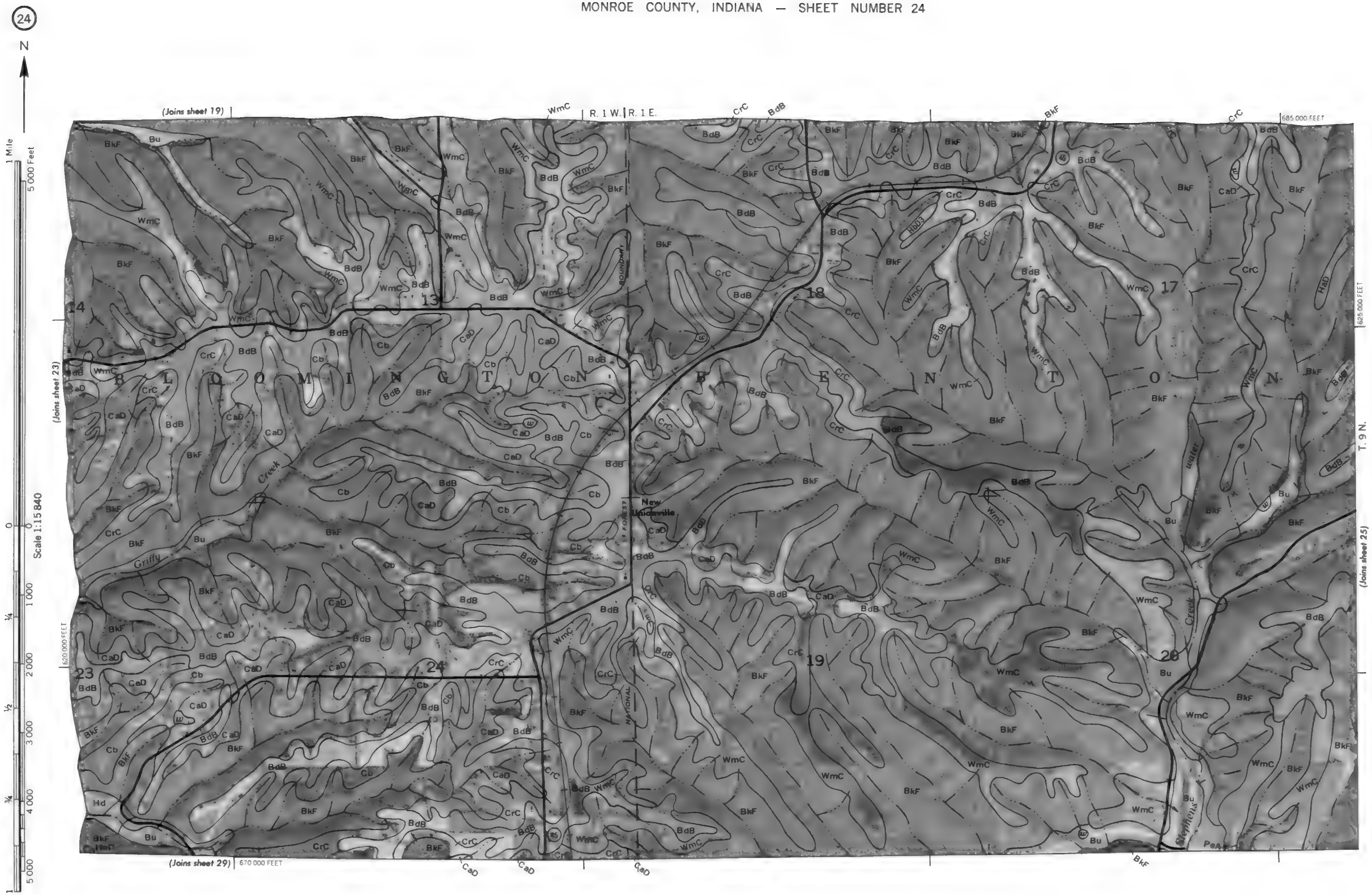
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MONROE COUNTY, INDIANA — SHEET NUMBER 22

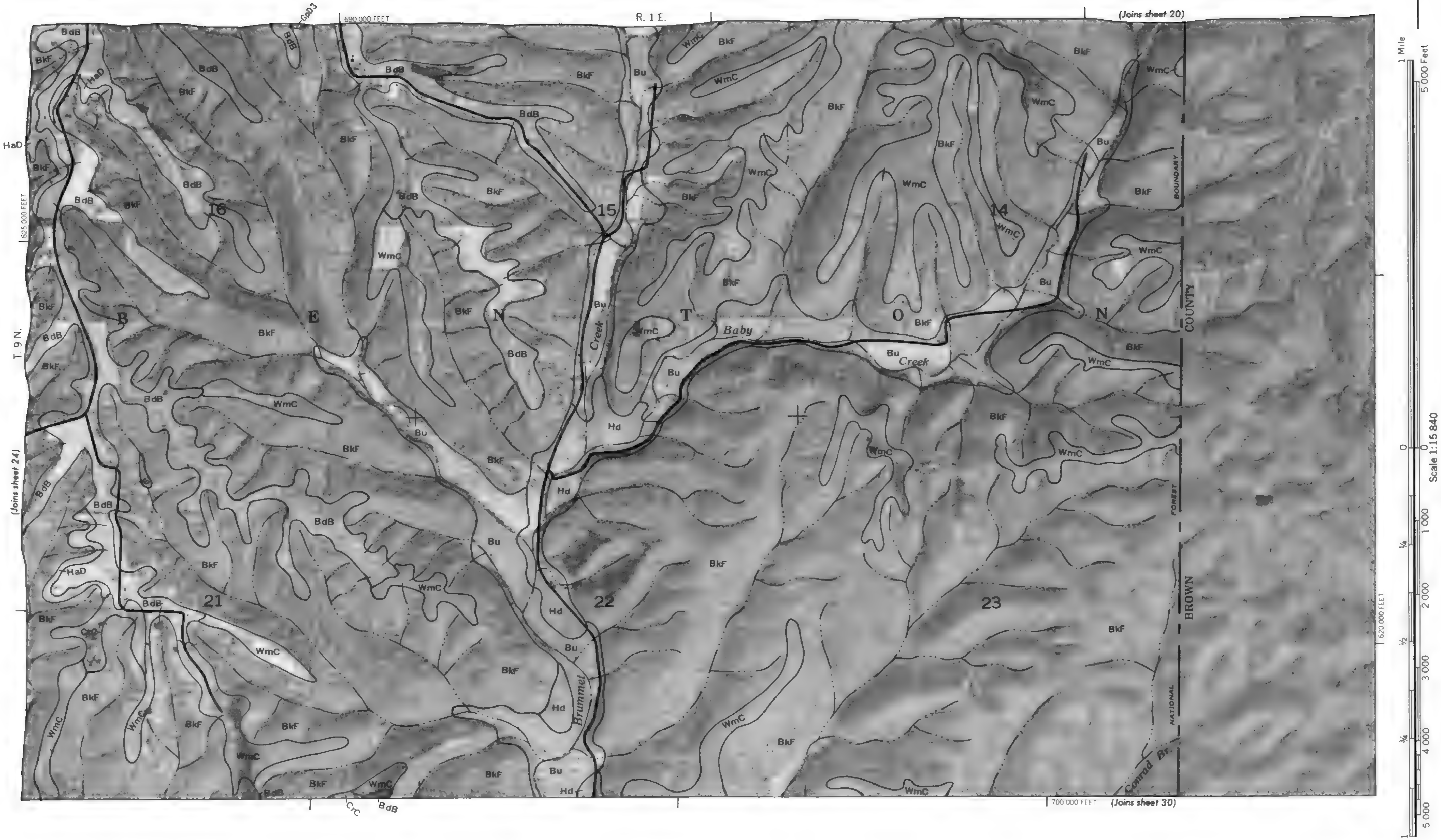
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned


N
(Joins sheet 18)
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 28)
R. 1 W.
T. 9 N.
650 000 FEET
625 000 FEET
665 000 FEET
BLOOMINGTON
Griffy Reservoir
Griffy Creek
Stout Creek
1 Mile
5 000 Feet
Scale 1:15 840

MONROE COUNTY, INDIANA — SHEET NUMBER 24



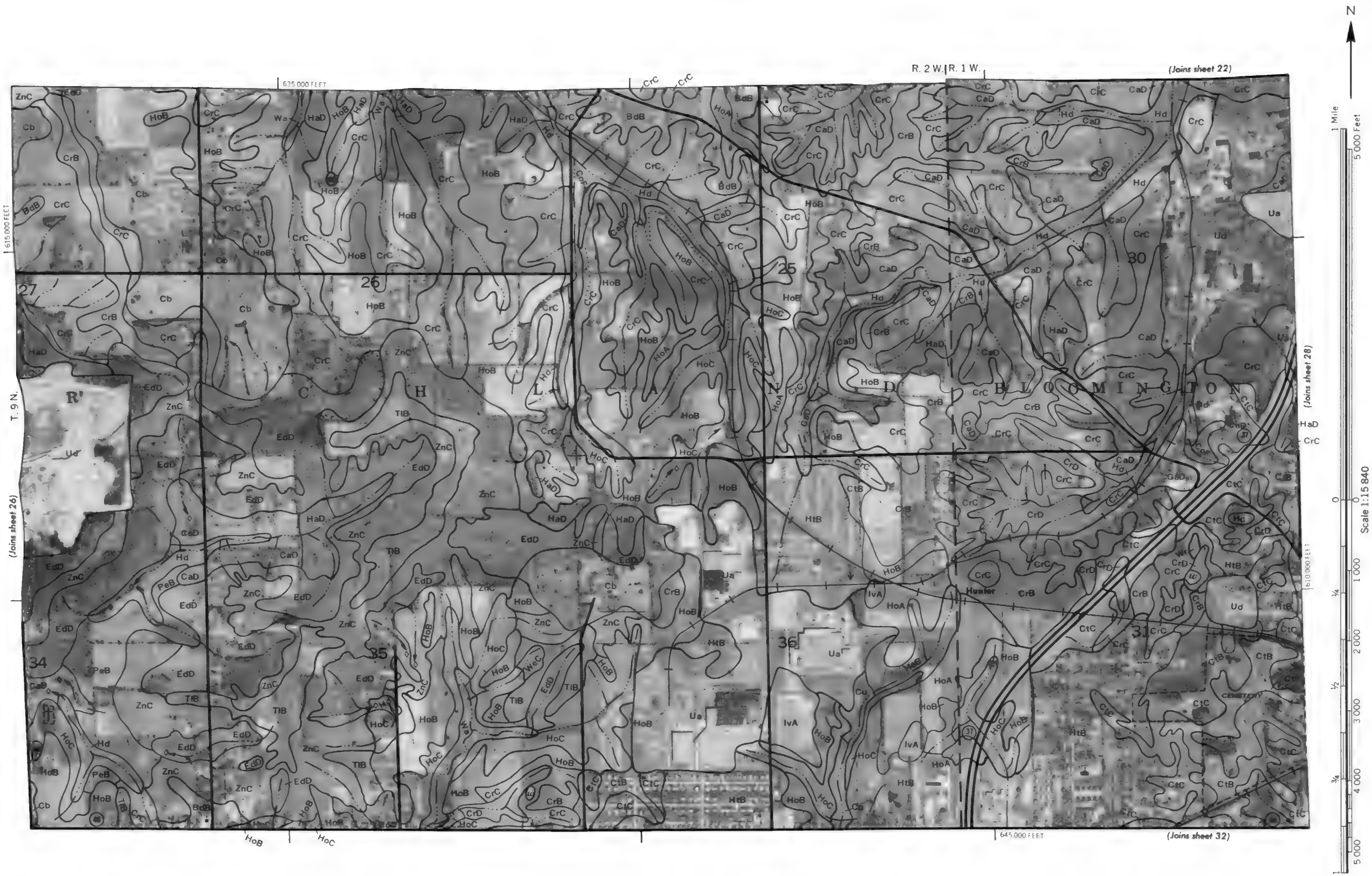
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



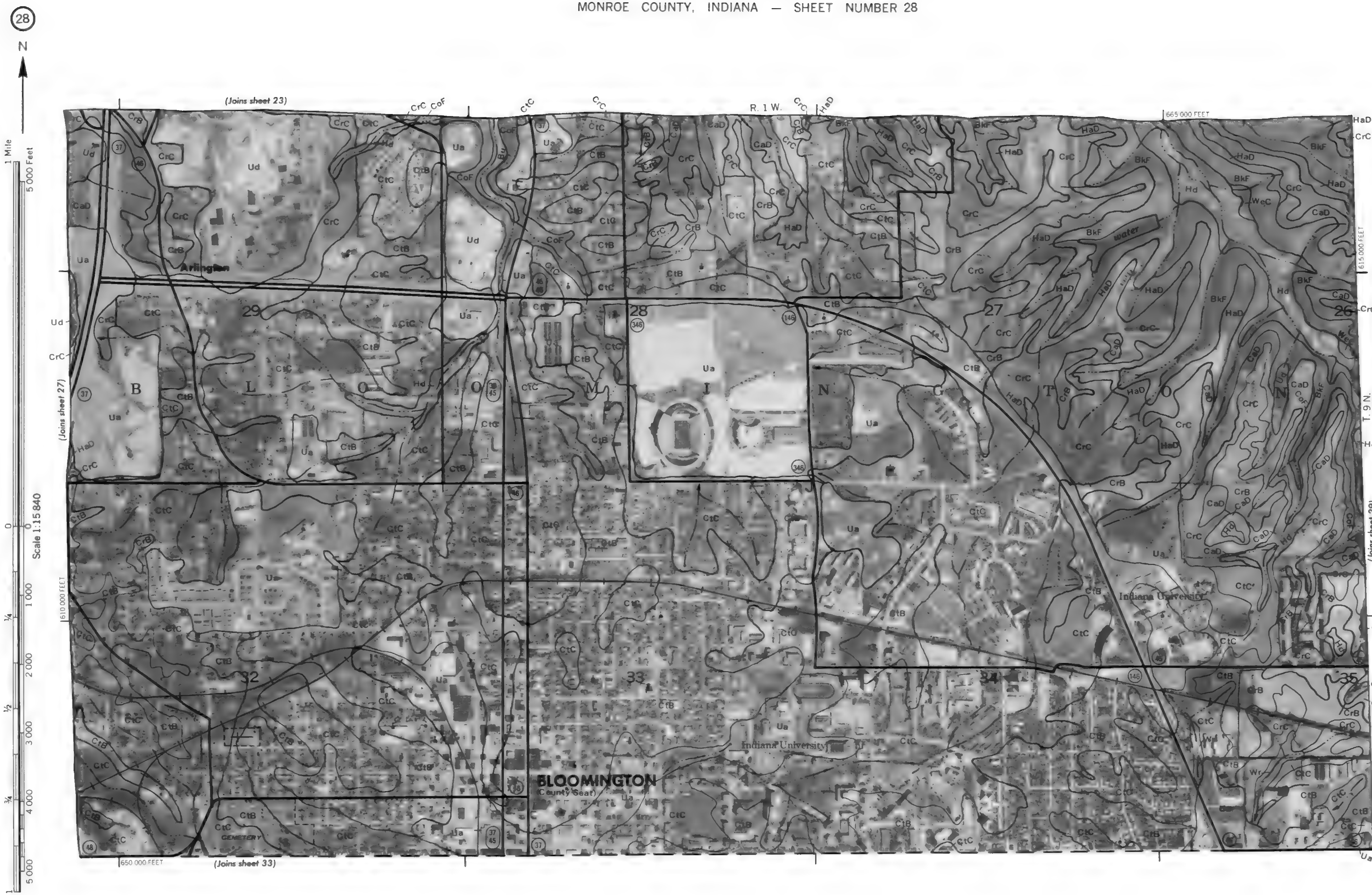
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

26

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooper[illegible]
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



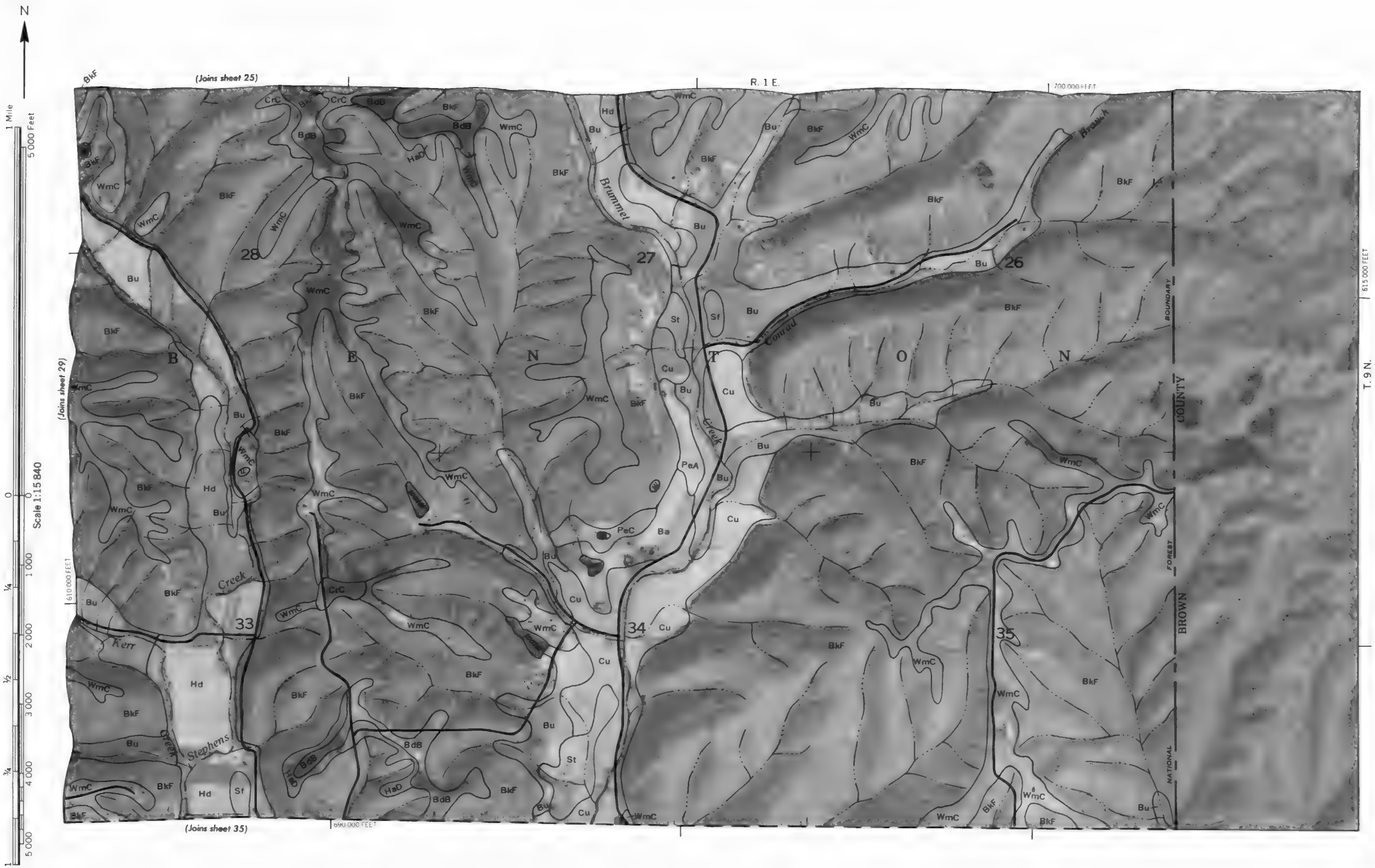
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



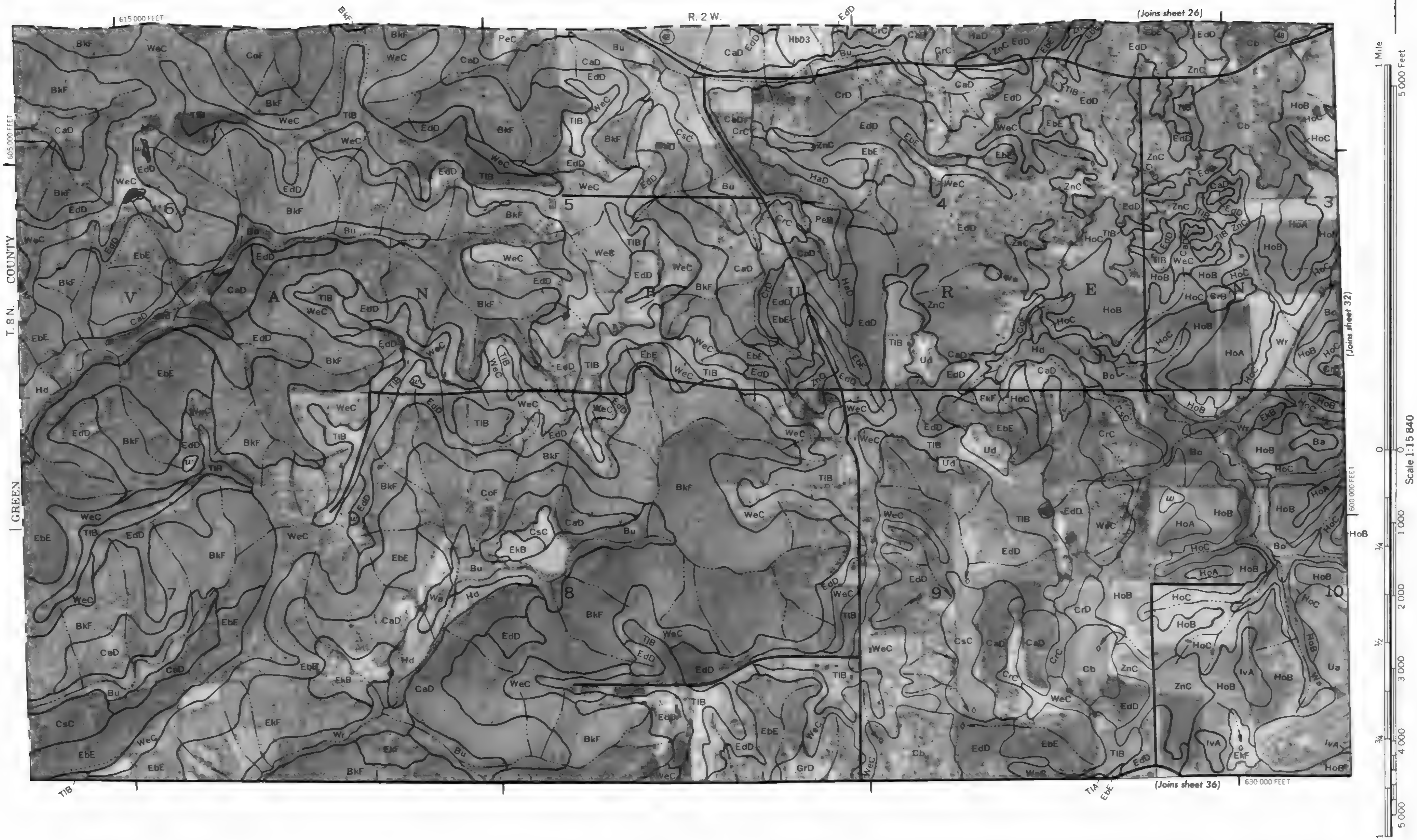
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

R. 1 W. | R. 1 E.
670 000 FEET
615 000 FEET
685 000 FEET
(Joins sheet 24)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 34)
T. 9 N.
B L O O M I N G T O N
BLOOMINGTON
Stephens Creek
Kerr Creek
FOREST BOUNDARY
NATIONAL
25
26
29
30
31
32
35
36
N
Scale 1:15 840
1 Mile
5 000 Feet

MONROE COUNTY, INDIANA — SHEET NUMBER 30



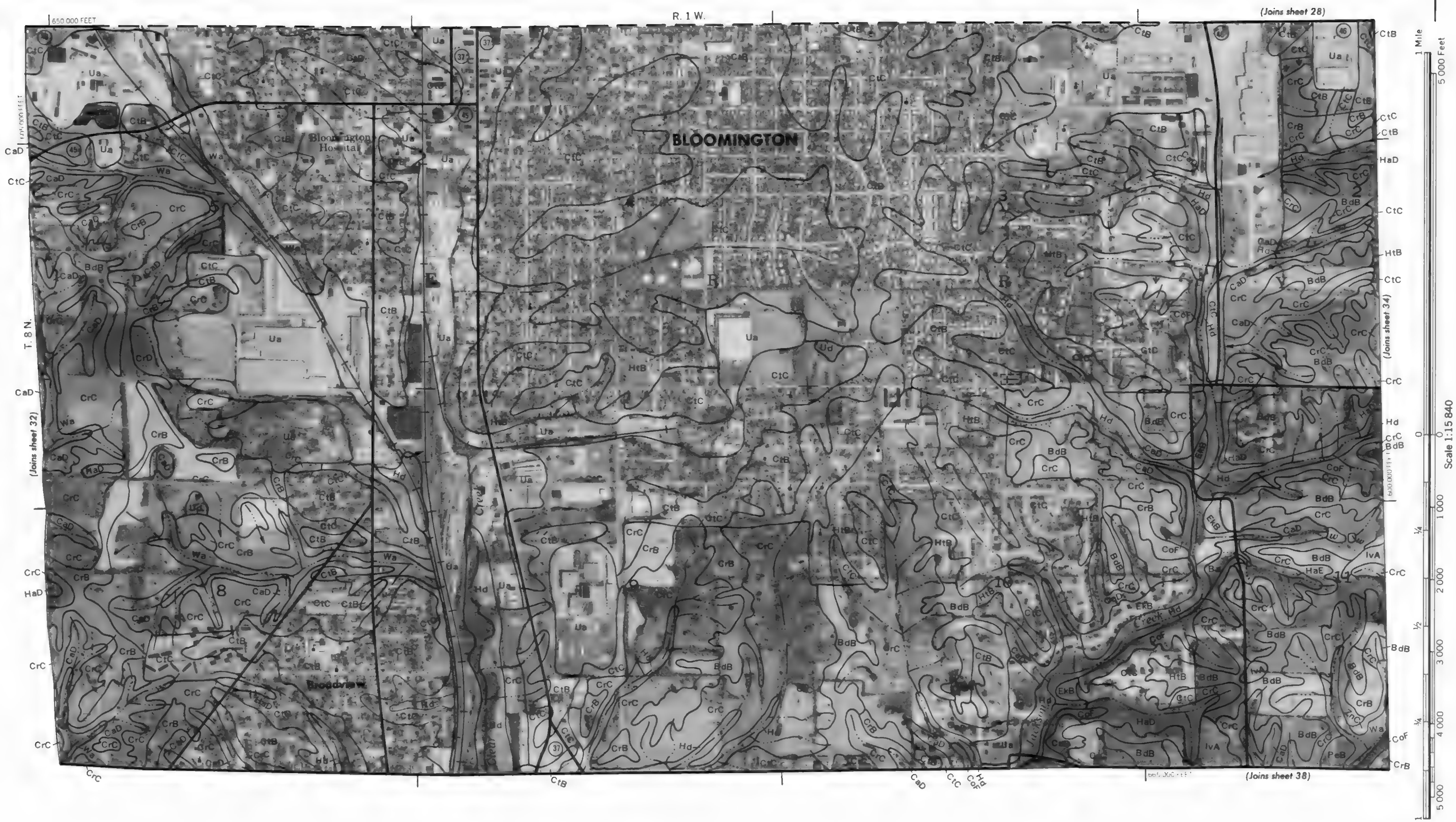
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
615 000 FEET
R. 2 W.
(Joins sheet 26)
605 000 FEET
T. 8 N.
GREEN COUNTY
VAN BUREN
(Joins sheet 32)
600 000 FEET
(Joins sheet 36)
630 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
5
4
3
6
7
8
9
10
BkF
WeC
CaD
EdD
TlB
EbE
HoB
HoC
ZnC
CrC
Bu

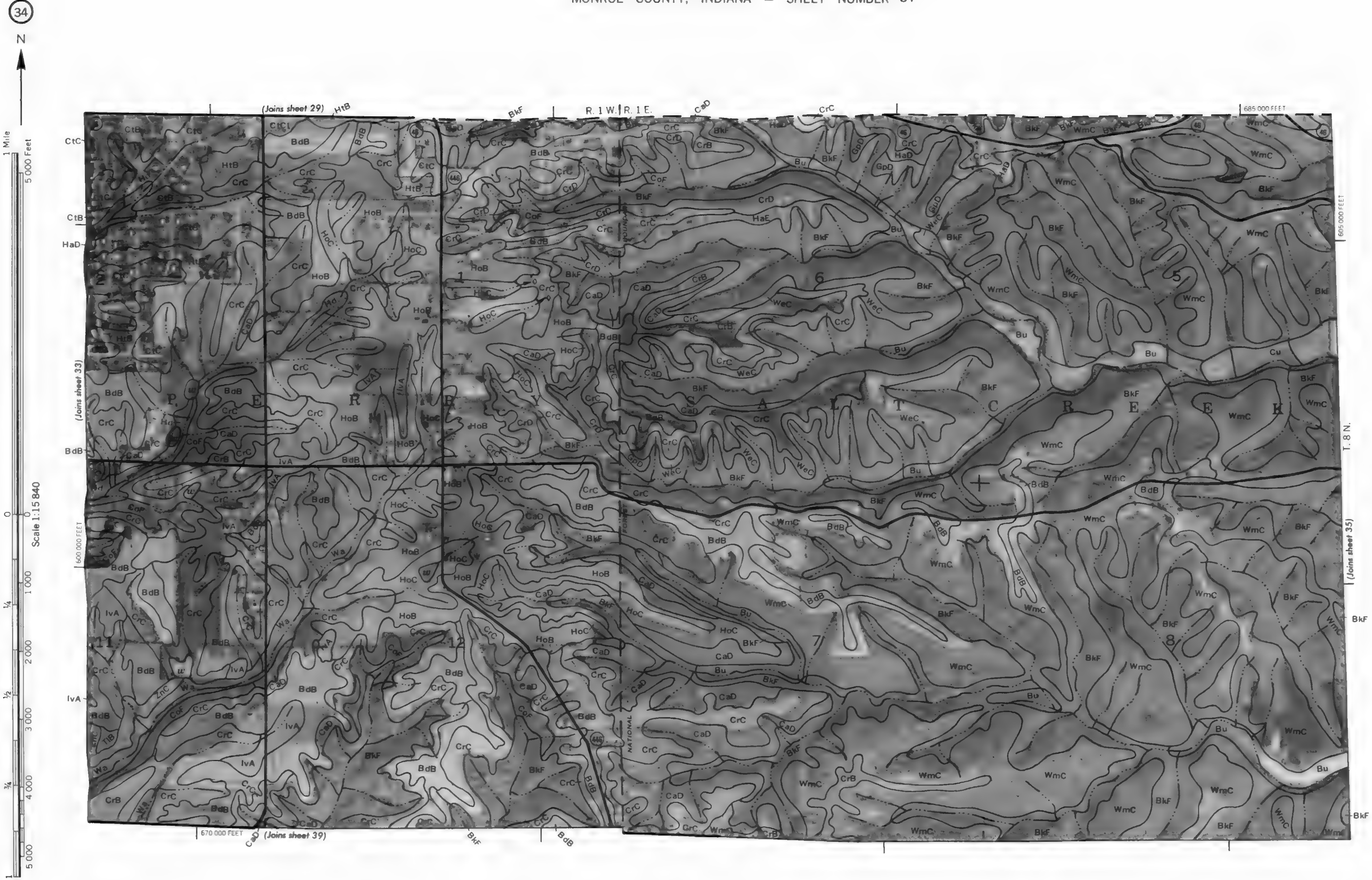
MONROE COUNTY, INDIANA — SHEET NUMBER 32

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

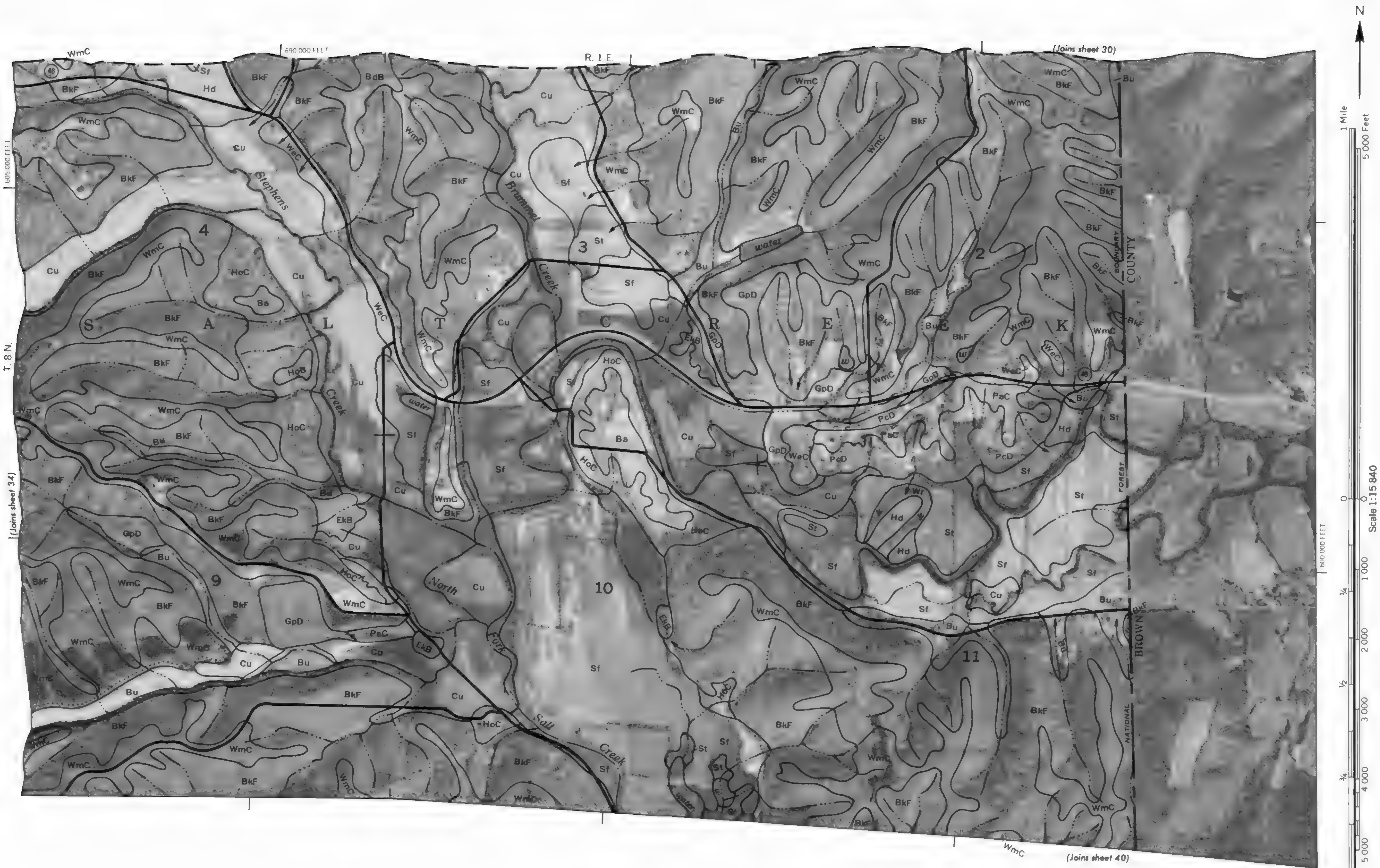
33



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

36

N

1 Mile

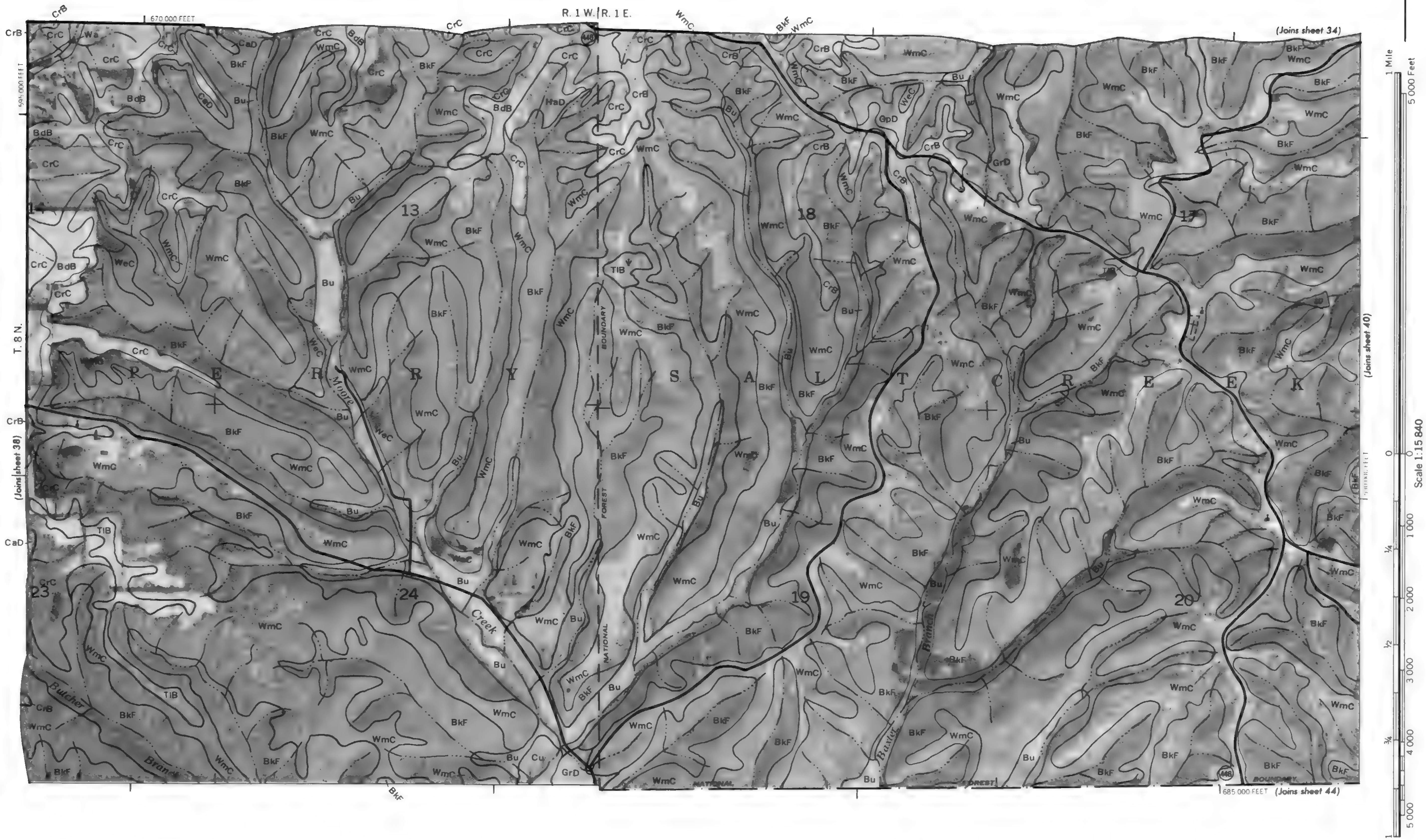
5 000 Feet

Scale 1:15 840

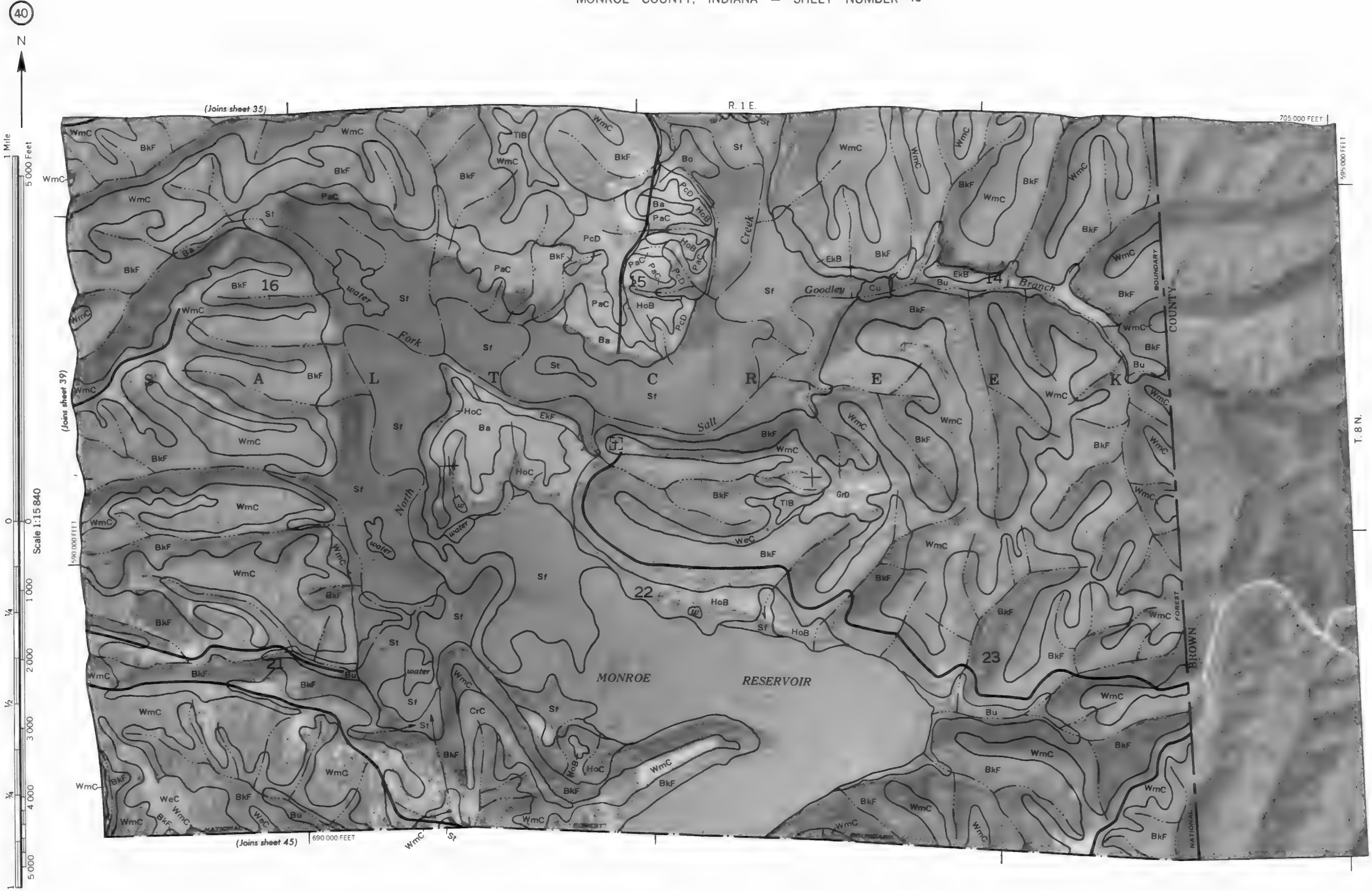
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

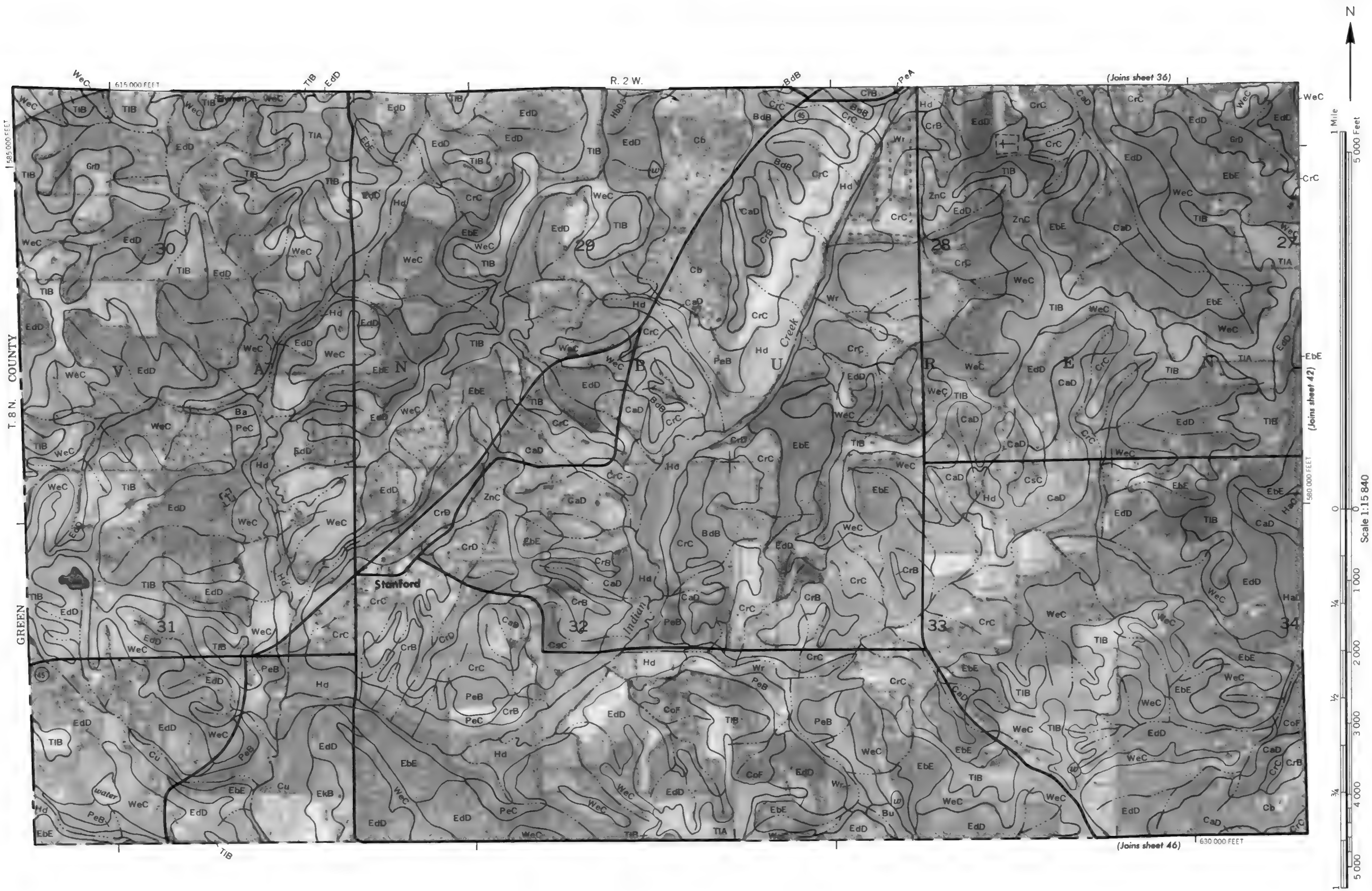
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



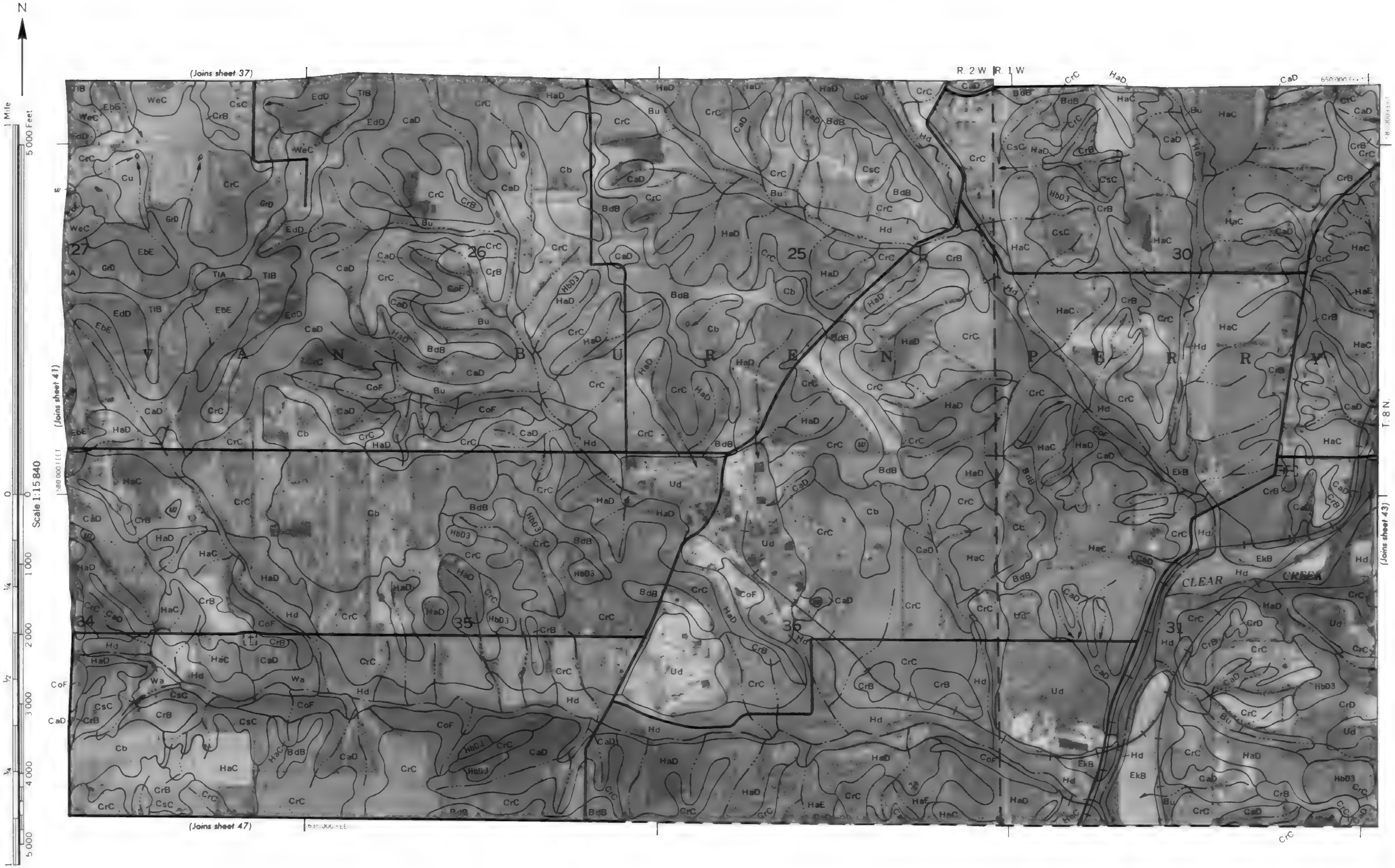
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

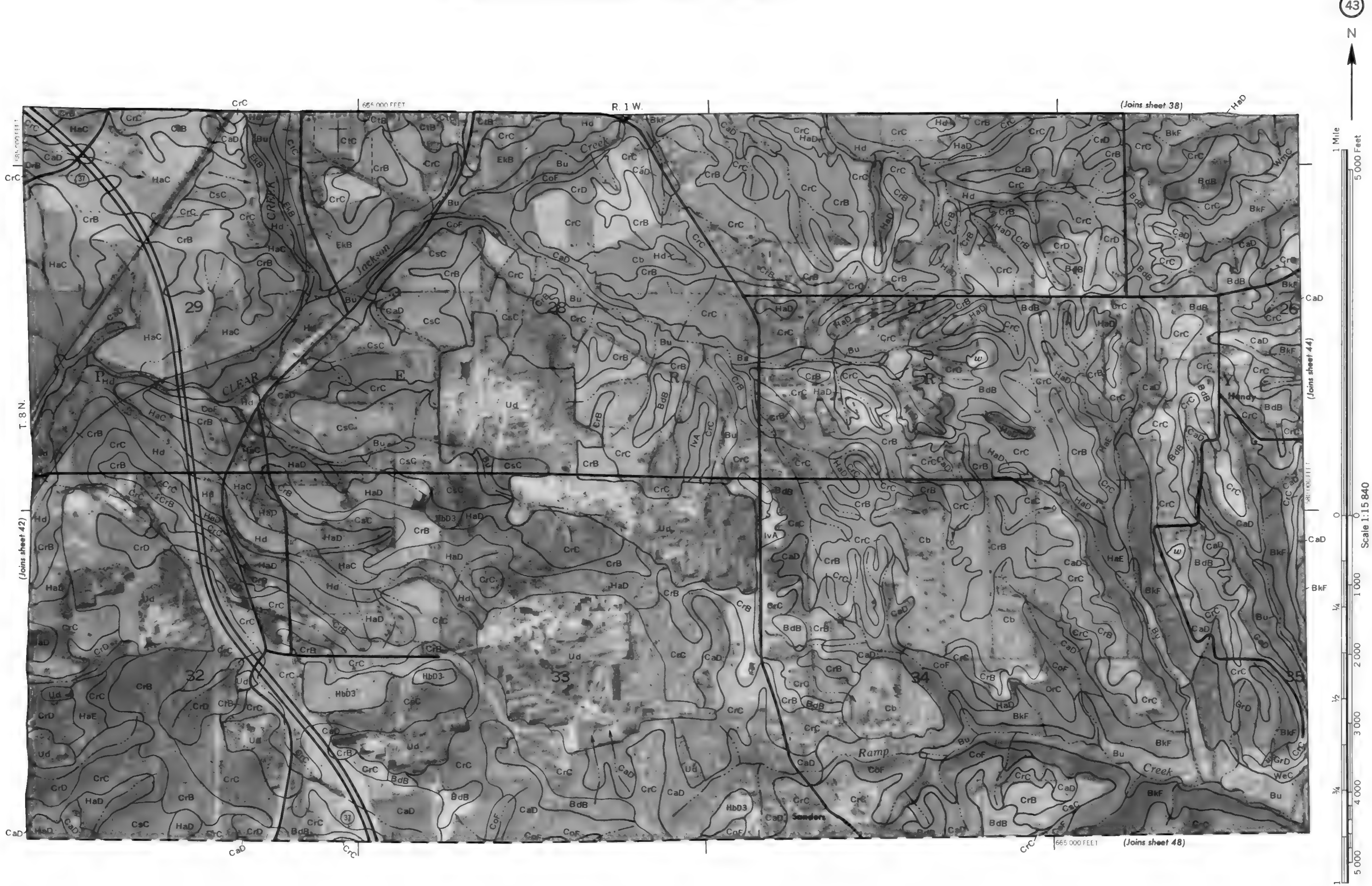


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

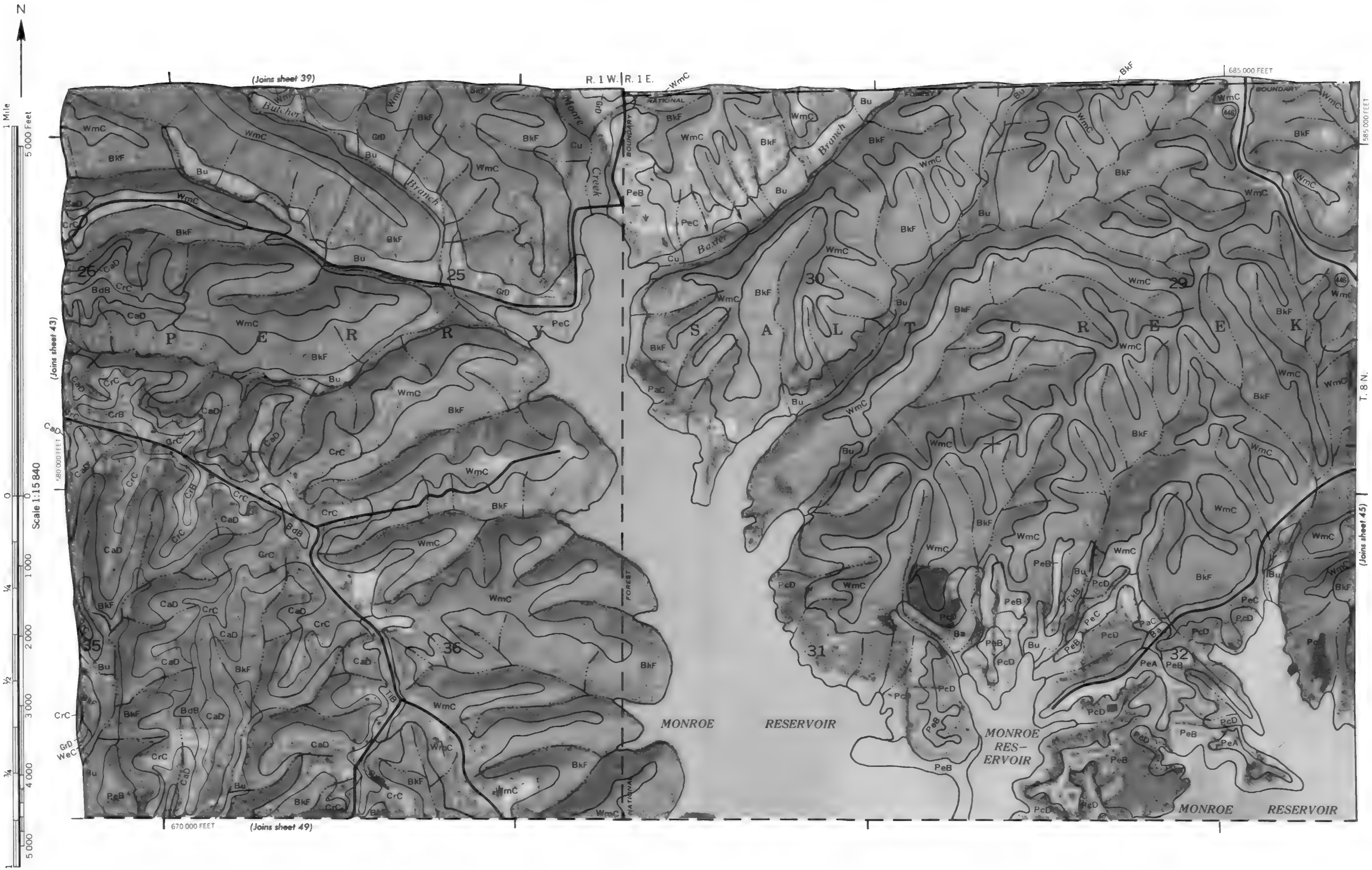


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

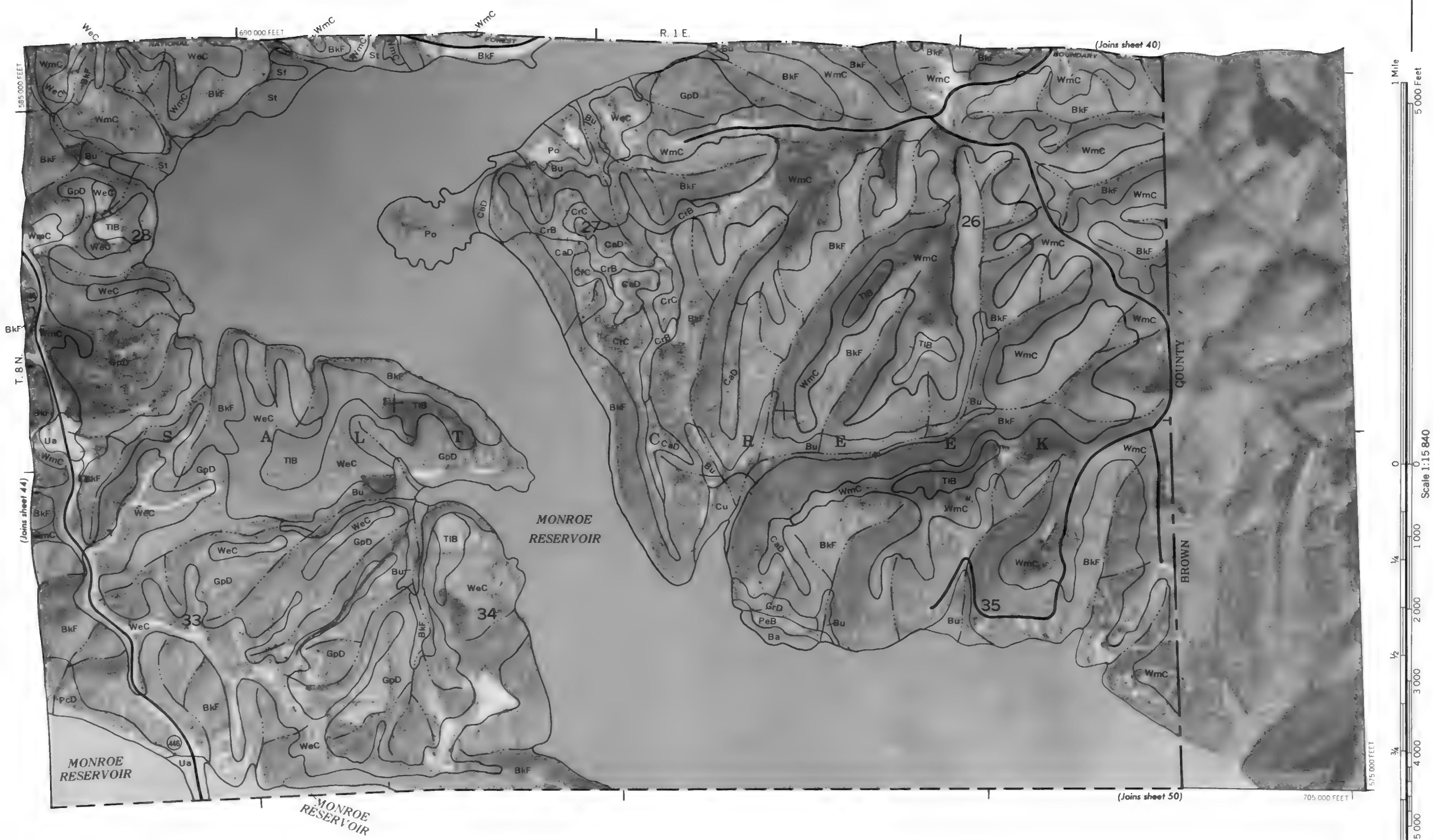

N
(Joins sheet 37)
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 47)
R. 2 W
R. 1 W
T. 8 N.
Scale 1:15 840
1 Mile
5 000 Feet
V A N B U R E N
P E R R Y
CLEAR CREEK
27
26
25
30
34
35
36
31

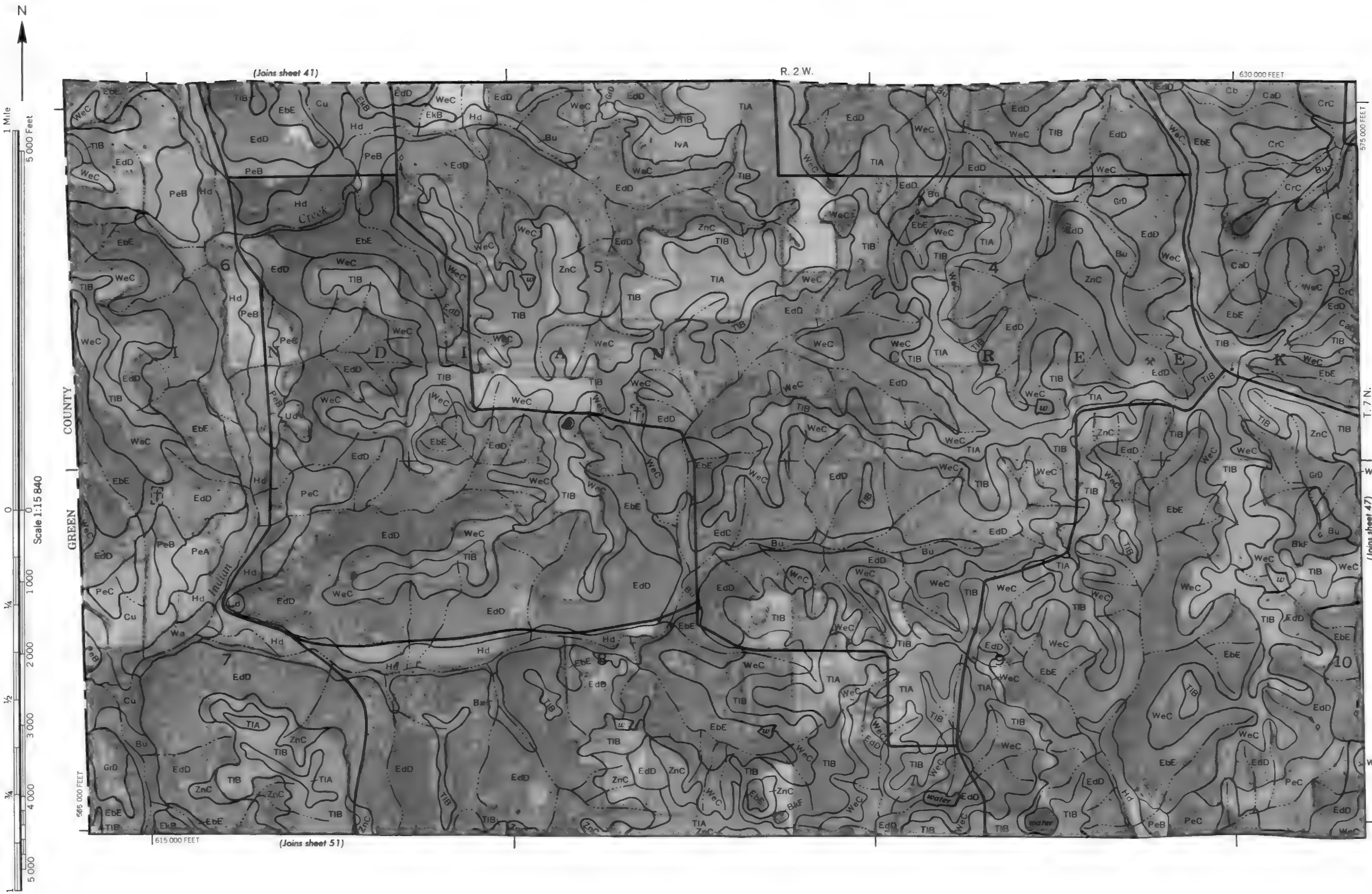


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



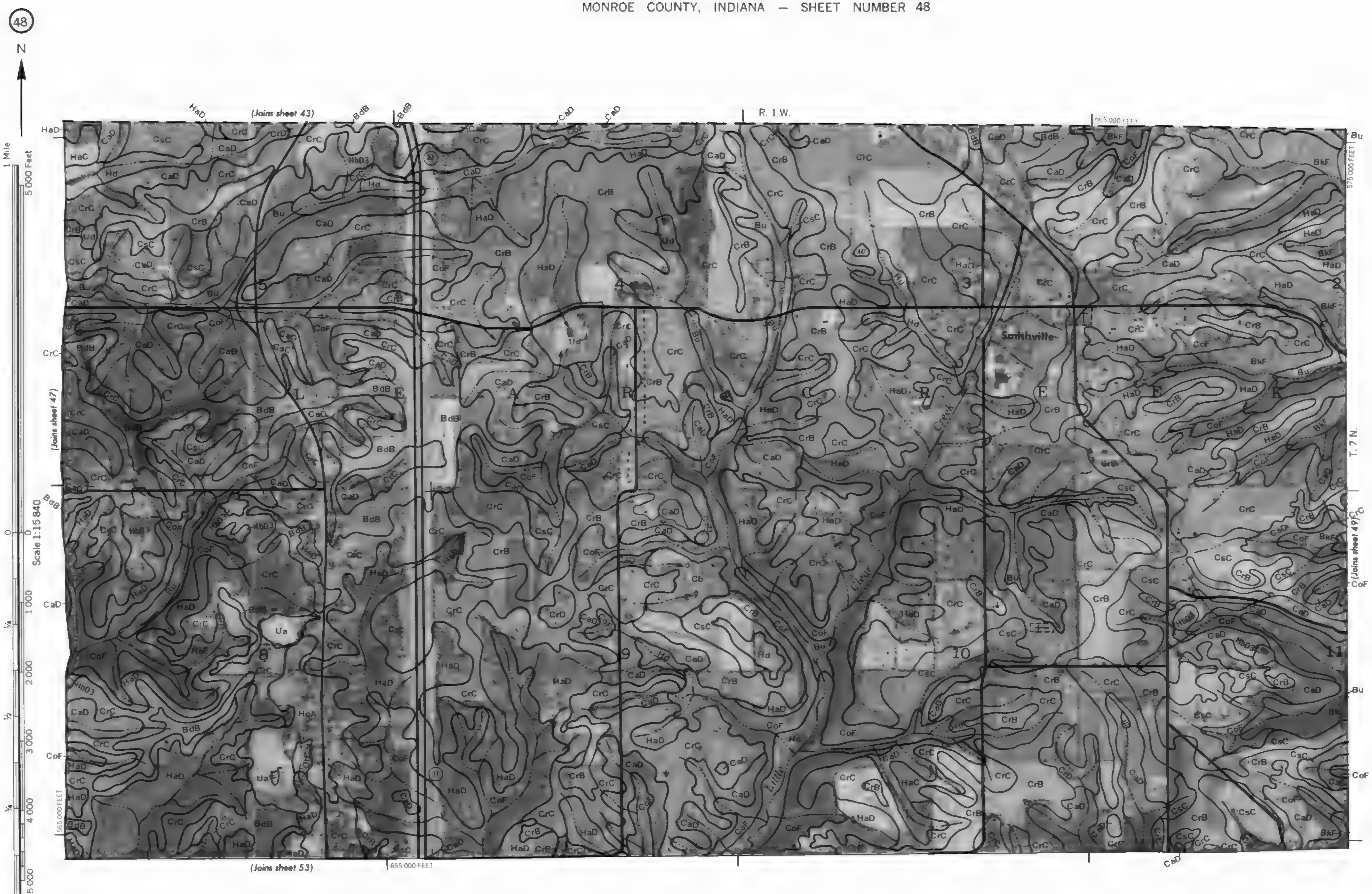
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


45
N
R. 1 E.
T. 8 N.
690 000 FEET
585 000 FEET
575 000 FEET
705 000 FEET
(Joins sheet 40)
(Joins sheet 44)
(Joins sheet 50)
MONROE RESERVOIR
MONROE RESERVOIR
MONROE RESERVOIR
SALT CREEK
BROWN COUNTY
NATIONAL FOREST BOUNDARY
446
26
27
28
33
34
35
WmC
WeC
BkF
GpD
St
Sf
Bu
Po
TIB
CaD
CrC
CrB
Cu
Ua
PcD
GrD
PeB
Ba
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
0
1000
2000
3000
4000
5000

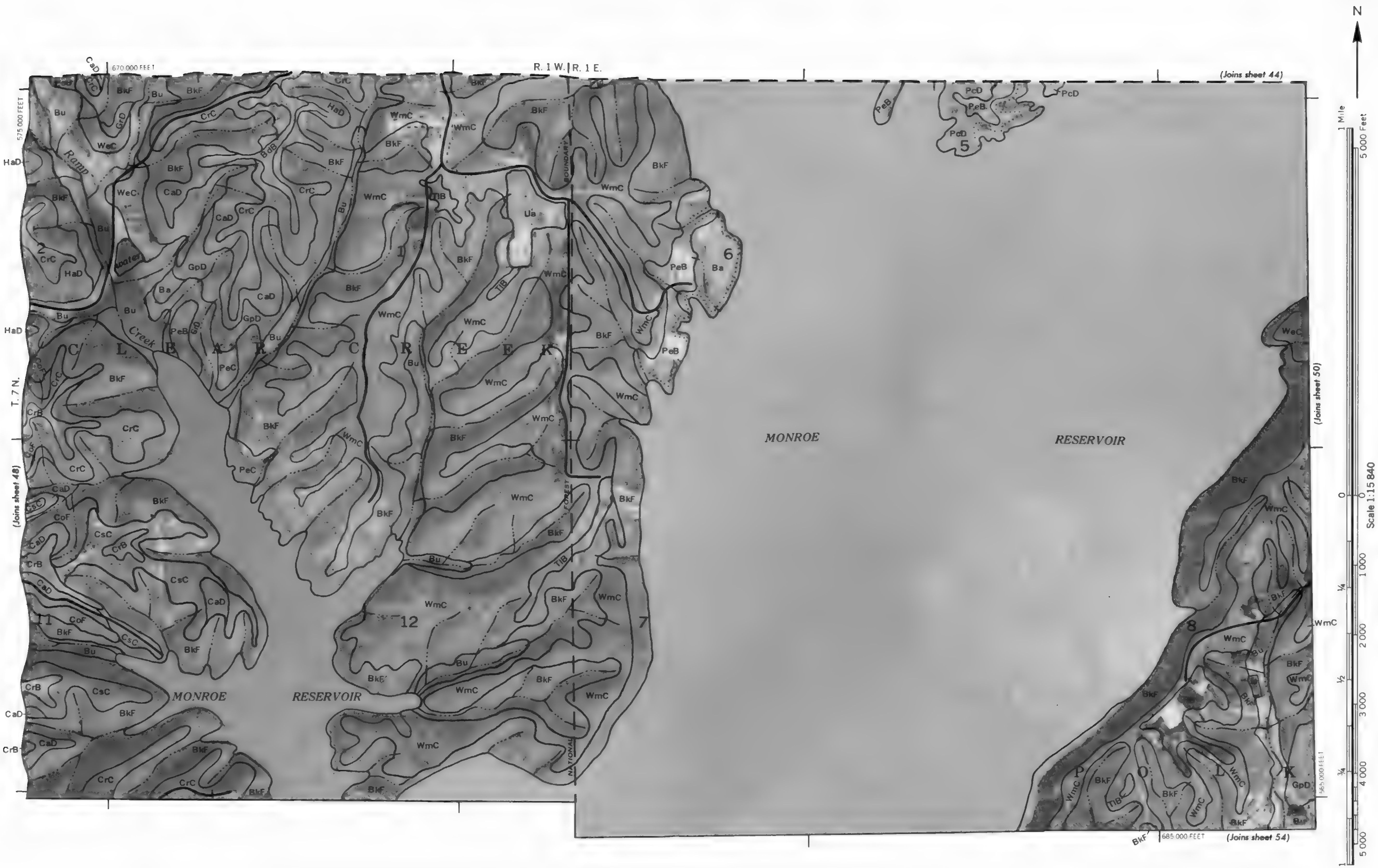

N
(Joins sheet 41)
R. 2 W.
630 000 FEET
575 000 FEET
T. 7 N.
(Joins sheet 47)
(Joins sheet 51)
615 000 FEET
565 000 FEET
GREEN COUNTY
INDIAN CREEK
Indian Creek
1 Mile
5 000 Feet
Scale 1:15 840
¼
½
¾
0
1 000
2 000
3 000
4 000
5 000

47


N
R. 2 W. | R. 1 W.
T. 7 N.
(Joins sheet 42)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 52)
INDIAN CREEK
CLEAR CREEK
Clear Creek
1 Mile
5 000 Feet
Scale 1:15 840
650 000 FEET
565 000 FEET
575 000 FEET



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

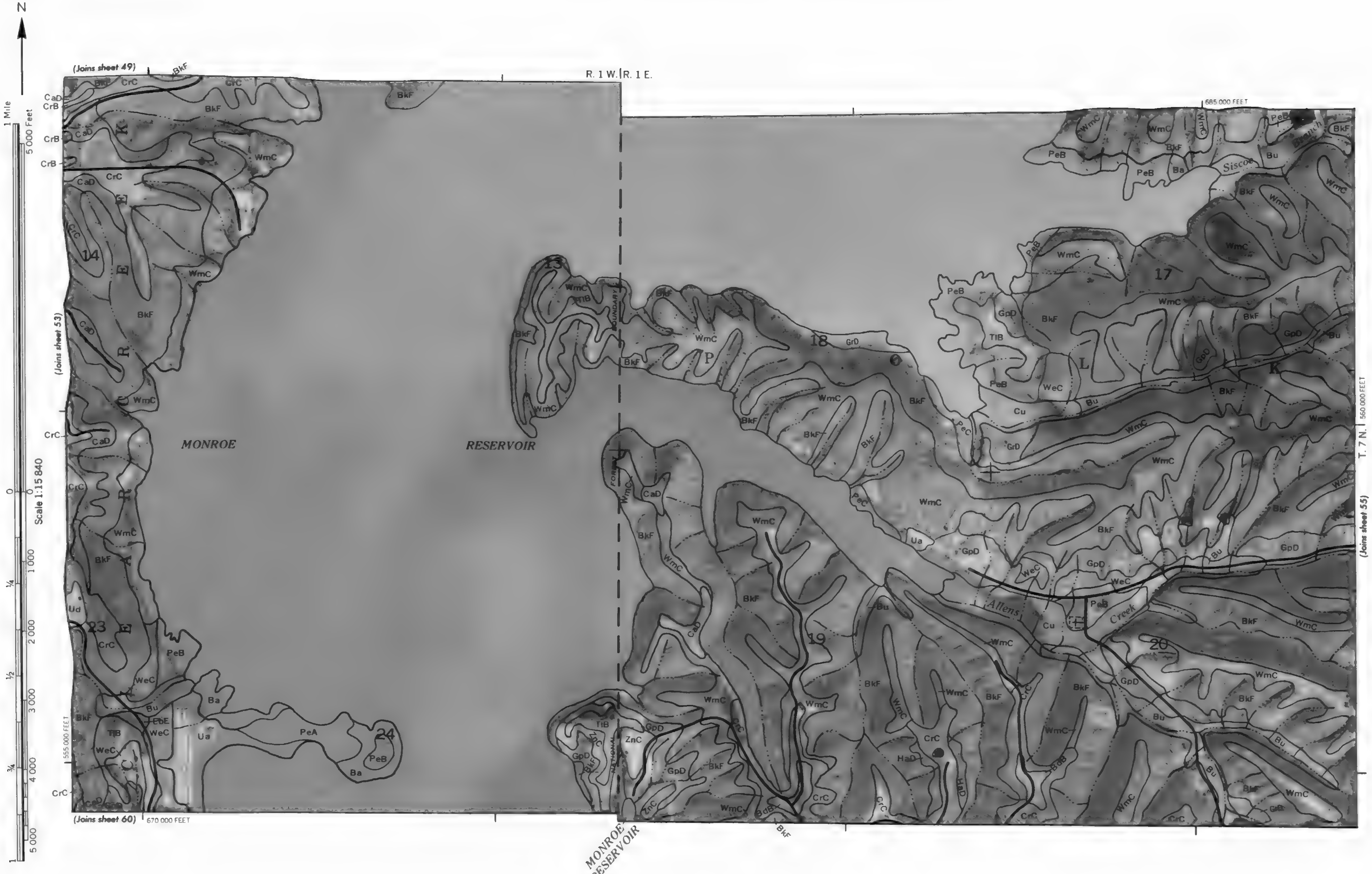

N
R. 1 W. | R. 1 E.
T. 7 N.
670 000 FEET
575 000 FEET
685 000 FEET
565 000 FEET
(Joins sheet 44)
(Joins sheet 48)
(Joins sheet 50)
(Joins sheet 54)
C L E A R C R E E K
Creek
Ramp
water
NATIONAL FOREST BOUNDARY
MONROE RESERVOIR
MONROE RESERVOIR
P O L K
Scale 1:15 840
1 Mile
5 000 Feet
BkF
WmC
CrC
CaD
Bu
HaD
WeC
CsC
CrB
CoF
PeB
PeC
PcD
Ba
TlB
GpD
Ua

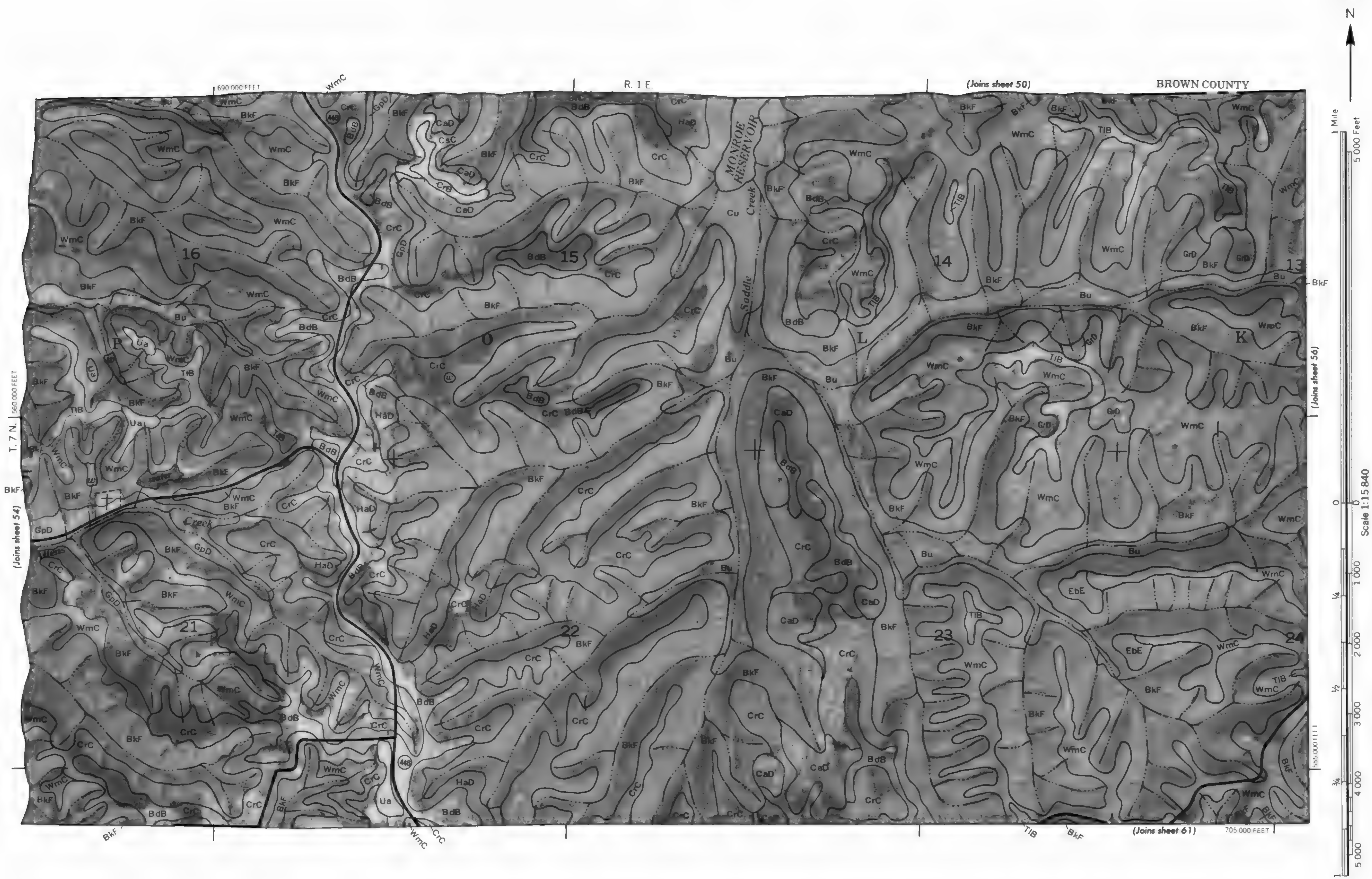
50
N
(Joins sheet 45)
R 1 E.
MONROE
RESERVOIR
MONROE
RESERVOIR
(Joins sheet 49)
(Joins sheet 55)
T 7 N.
MONROE RESERVOIR
BROWN
COUNTY
Scale 1:15 840
1 Mile
5 000 Feet
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000
690 000 FEET
565 000 FEET
575 000 FEET
2
3
4
9
10
11
L
K
BkF
CaD
PcD
PeB
Po
TlB
GpD
WmC
WeC
PaC
Ua
Ba
CrC
BdB
Bu
CsC
HaD
Cu
Hd

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

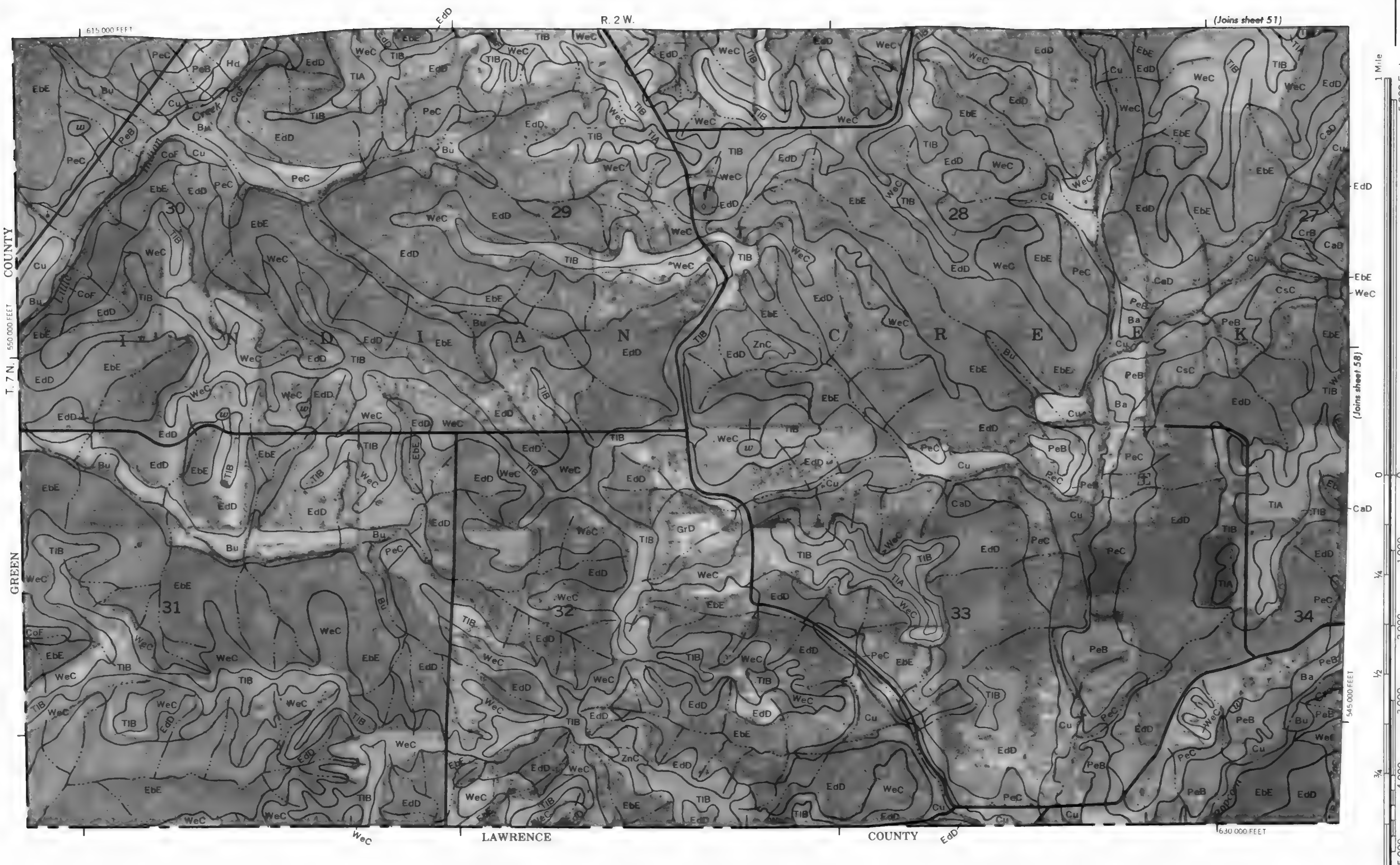
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

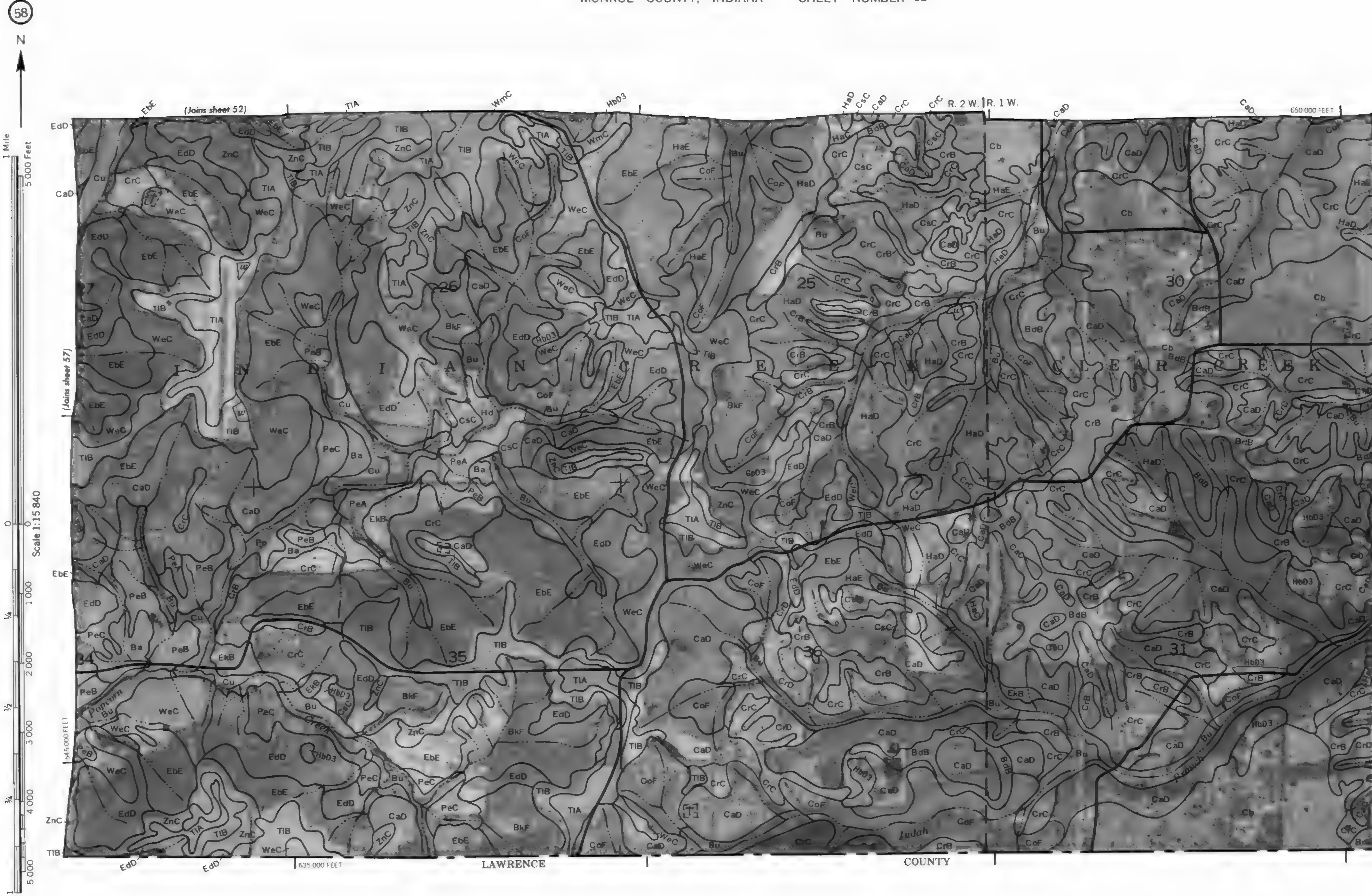

54
N
(Joins sheet 49)
R. 1 W. | R. 1 E.
685 000 FEET
(Joins sheet 53)
(Joins sheet 55)
(Joins sheet 60)
670 000 FEET
555 000 FEET
560 000 FEET
T. 7 N.
1 Mile
5 000 Feet
Scale 1:15 840
MONROE
RESERVOIR
MONROE RESERVOIR
NATIONAL
FOREST
BOUNDARY
Siscoe
Branch
Allens
Creek
13
14
17
18
19
20
23
24
BkF
CrC
CaD
CrB
WmC
WeC
PeB
PeA
PeC
Ba
Bu
Cu
Ua
Ud
TlB
EoE
GpD
GrD
ZnC
HaD
BdB
GlB



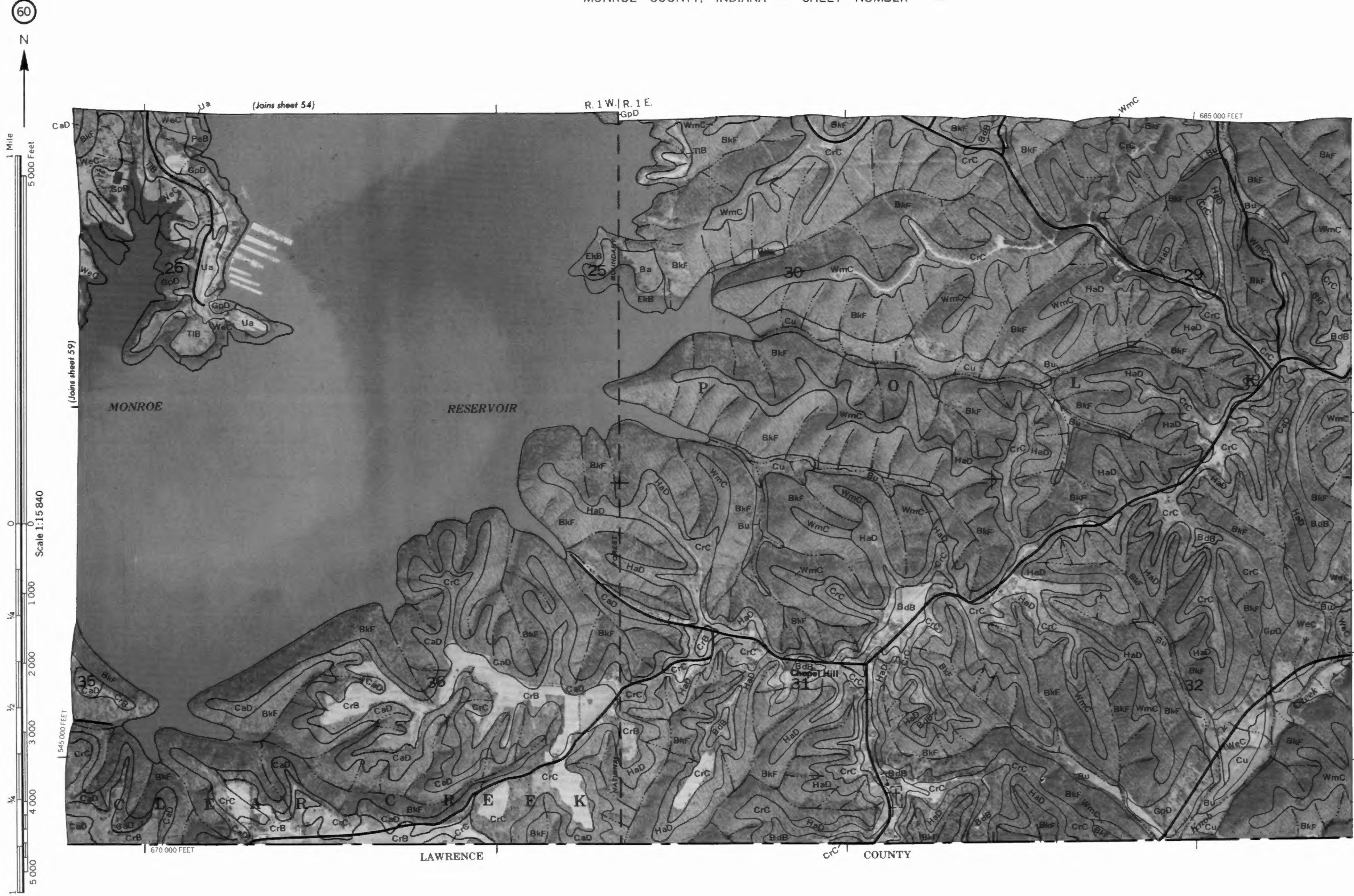
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.


56
N
BROWN
COUNTY
JACKSON
COUNTY
R 1 E
R 2 E
T. 7 N.
(Joins sheet 55)
(Joins sheet 62)
710 000 FEET
555 000 FEET
Scale 1:15 840
1 Mile
5 000 Feet
Brunch
Taylor
13
17
18
19
20
24
O
P
L
K


N
R. 2 W.
(Joins sheet 51)
(Joins sheet 58)
T. 7 N.
GREEN COUNTY
LAWRENCE COUNTY
I N D I A N C R E E K
Little Indian Creek
615 000 FEET
550 000 FEET
545 000 FEET
630 000 FEET
27
28
29
30
31
32
33
34
Scale 1:15 840
1 Mile
5 000 Feet
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000


58
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 52)
(Joins sheet 57)
(Joins sheet 59)
R. 2 W.
R. 1 W.
T. 7 N.
I N D I A N C R E E K
C L E A R C R E E K
LAWRENCE
COUNTY
650 000 FEET
635 000 FEET
545 000 FEET
26
25
30
35
36
31
Popcorn
Creek
Judah
Branch

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.